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- ☐ Journal Article
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B. Document Number DOE/RL-2004-~~050~~ 50 LLF 9-8-04, REV.0

C. Title
RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR CONSOLIDATED T PLANT OPERATIONS

D. Internet Address

E. Required Information

1. Is document potentially Classified? ◉ No ○ Yes (MANDATORY)

 7Sept04
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 If Yes ____ ○ No ○ Yes Classified
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3. Date of Conference ____
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H. Author/Requestor
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(Print and Sign)

Responsible Manager
7Sept04
(Print and Sign)

I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
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Office of External Affairs	☐			Y / N
DOE-RL	☒	M. Collins	per Email Sept 7 '04	Y / N
Other	☒	M. Spracklen	per Email Sept 7 '04	Y / N
Other	☐			Y / N

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Information Clearance Approval

APPROVED FOR RELEASE
OFFICIAL DOCUMENT
Date 9/8/04

K. If Additional Comments, Please Attach Separate Sheet

SEP 0 8 2004 (65) STA 15

DOCUMENT PROCESSING AND APPROVAL SUMMARY FORM

DOCUMENT TITLE:
RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR CONSOLICATED T PLANT OPERATIONS

OWNING ORGANIZATION/FACILITY:
WASTE MANAGEMENT/GROUNDWATER PROTECTION PROJECT

New Document? ☒ Yes ☐ No | Document Number: DOE/RL-2002-~~050~~ 50 N.F 9-8-04 | Revision/Change Number 0

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☐ Policy ☐ Requirements Document ☐ Procedure ☐ Management Plan
☐ Management Directive ☐ Guidance Document ☒ Other NOC

DOCUMENT ACTION ☐ Revision ☐ Field Change No.
☐ Cancel ☐ Minor Change ☐ Major Change ☐ Periodic Review (next review date)

DOCUMENT LEVEL ☐ 1 ☐ 2 ☒ 3 | **ISMS** Implementing Mechanism? ☐ Yes ☒ No

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VALIDATION SIGNATURE ☐ Sat (No Comments) ☐ Unsat (Comments - See Attached)

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RESPONSIBLE CONTACTS

	Name	Phone Number
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Interpretive Authority (IA)*:	FEN SIMMONS	372-0413

DOCUMENT CONTROL
Does document contain scientific, technical, or controlled-use information intended for public use? ☒ Yes ☐ No
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Are the existing variances to the document still valid? ☐ Yes ☐ No ☒ N/A
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IMPACTS *(Are there anticipated impacts to cost, schedule, or scope?)* ☐ Yes ☐ No
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* For Level 3 Technical Procedures this is the Technical Authority (TA).
**For Level 3 Technical Procedures this is the Facility Manager.

DOCUMENT PROCESSING AND APPROVAL SUMMARY FORM (continued)

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DESIGNATED REVIEWERS

Name *(print)*	Organization
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APPROVAL SIGNATURES

Interpretive Authority*: Name: F. SIMMONS	Date Signed 9-7-04
Functional Manager:** Name: J. HYATT	Date Signed 7 Sep 04
President's Office Approval (for Policies and Management Directives only): Name:	Date Signed
Other: ______ Name:	Date Signed
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* For Level 3 Technical Procedures this is the Technical Authority (TA).
**For Level 3 Technical Procedures this is the Facility Manager.

DOE/RL-2004-50
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Radioactive Air Emissions Notice of Construction for Consolidated T Plant Operations

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

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Radioactive Air Emissions Notice of Construction for Consolidated T Plant Operations

Date Published
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Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

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P.O. Box 550
Richland, Washington 99352

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APPENDICES

FIGURES

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TERMS

ABCASH	Automated Bar Coding of Air Samples at Hanford
ALARA	as low as reasonably achievable
ALARACT	as low as reasonably achievable control technology
APQ	annual possession quantity
ASME	American Society of Mechanical Engineers
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BARCT	best available radioactive control technology
BFA	blanket fuel assemblies
CAM	continuous air monitor
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CH	contact-handled
Ci	curie
Ci/yr	curies per year
COLIWASA	composite liquid waste sampler
CSB	Canister Storage Building
CSEF	Containment Systems Experiment Facility
CSTF	Containment Systems Test Facility
CWC	Central Waste Complex
DE-Ci	dose equivalent curie
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FH	Fluor Hanford
FRP	fiberglass reinforced plywood
HEPA	high-efficiency particulate air (filter)
HPT	health physics technician
hr	hour
ICRP	International Commission of Radiation Protection
ID	identification
IOPS	Integrated Operations
KE	K East
KW	K West
L	left
LDC	large diameter container
LIGO	Laser Interferometer Gravitational Wave Observatory
LLBG	Low-Level Burial Ground

LLW	Low-Level Waste
μCi/dm^2	microcuries per decimeter squared
μCi/ml	microcuries per milliliter
m	meter
M-91	Contact-Handled (CH) and Remote-Handled (RH) TRU Waste Storage and Treatment Project
MEI	maximally exposed individual
ml	milliliter
MLLW	mixed low-level waste
mrem	millirem
mrem/yr	millirem per year
MW	mixed waste
NDA	nondestructive assay
NDE	nondestructive examination
NLOP	North Load-Out Pit
NOC	notice of construction
NoC	notice of correction
PCB	polychlorinated biphenyl
PCM	personnel contamination monitor
PTE	potential to emit
PTRAEU	portable temporary radioactive air emissions unit
PWR	Pressurized Water Reactor
R	right
RCRA	*Resource Conservation Recovery Act of 1976*
RH	remote-handled
RH-TRU	remote-handled transuranic
RWP	radiological work permit
SEPA	*State Environmental Policy Act of 1971*
SNF	spent nuclear fuel
SOW	statement of work
S Plant	Reduction Oxidation Facility
SSFC	Shippingport Spent Fuel Container
STS	Sludge Transportation System
SWITS	Solid Waste Information Tracking System
T Plant	T Plant Complex
TEDE	total effective dose equivalent
TLD	personnel dosimetry
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
TRU	transuranic
TRUM	transuranic mixed
USQ	unreviewed safety question
VE	visual examination
VOA	volatile organic analysis

WAC	Washington Administrative Code
WDOH	Washington State Department of Health
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility
yr	year

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1993, Professional Publications, Inc., Belmont, California.

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION FOR CONSOLIDATED T PLANT OPERATIONS

This document serves as a notice of construction (NOC) application, pursuant to the requirements of Washington Administrative Code (WAC) 246-247, "Radiation Protection - Air Emissions," and Title 40 Code of Federal Regulations (CFR), Part 61, "National Emission Standards for Hazardous Air Pollutants," for conducting treatment, storage and/or disposal (TSD), decontamination, and related activities at the 221-T Building and associated structures, e.g., 221-T Tunnel - of T Plant Complex (T Plant). Graphic presentations for this NOC are provided in Figures 1 through 5. T Plant is operated by Fluor Hanford (FH) for the U.S. Department of Energy (DOE).

1.0 FACILITY LOCATION

Name and address of the facility, and location (latitude and longitude) of the emission unit:

The address and geodetic coordinates for T Plant (represented by the Hanford Meteorological Station) are as follows:

U.S. Department of Energy, Richland Operations Office (DOE-RL)
Hanford Site
Richland, WA 99352

46° 33' 48" North Latitude
119° 36' 22" West Longitude

The 221-T Building is located in the 200 West Area on the Hanford Site (Figures 1. and 2). T Plant is located inside the controlled-area fence of the 200 Areas.

2.0 RESPONSIBLE MANAGER

Name, title, address and phone number of the responsible manager:

Mr. Matthew S. McCormick, Assistant Manager for Central Plateau
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 373-9971.

3.0 TYPE OF PROPOSED ACTION

Identify the type and proposed action for which this application is submitted.

This NOC application is a significant modification of an existing emission unit under WAC 246-247 regulations because the proposed addition of radioactive material for support of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2001) Milestone "M-91 Initiative for Treatment and Storage of Contact-Handled and Remote-Handled Transuranic Waste" results in an increased potential to emit (PTE) of greater than 1.0 millirem per year (mrem/yr) total effective dose equivalent (TEDE) to the maximally exposed individual (MEI).

Approval of this NOC supersedes previous T Plant permits, applications, and approvals provided by the U.S. Environmental Protection Agency (EPA) and/or the Washington State Department of Health (WDOH). The approvals/licenses are limited to radioactive air emissions.

4.0 STATE ENVIRONMENTAL POLICY ACT

If the project is subject to the requirements of the State Environmental Policy Act (SEPA) of 1971 contained in chapter 197-11 WAC, provide the name of the lead agency, lead agency contact person, and their phone number.

Under WAC 197-11-845, the proposed action and proposed activities categorically are exempt from the requirements of SEPA.

5.0 PROCESS DESCRIPTION

Detailed process descriptions of specific activities for which past permit approvals have been obtained from WDOH and EPA are contained in attached appendices. As new projects evolve for T Plant, these projects will be incorporated in this NOC as appropriate. This format allows for the close out of specific appendices when an activity is completed.

5.1 221-T GENERAL FACILITY DESCRIPTION AND OPERATIONAL ACTIVITIES AT T PLANT

The following sections provide detail on activities that are ongoing, normal and routine operations, i.e., operational activities:

- 221-T Process Cell inventories, characterization, and current and future plans
- 221-T general facility description
- Radioactive air emission compliance for the 221-T Building
- Treatment and storage of contact-handled (CH) waste.

5.2 221-T PROCESS CELLS

Operational activities in the 221-T process cells continue as a vital mission for the Hanford Site as well as for other offsite facilities. The design of the process cells enables the cells to be used for a variety of missions for hazardous, radioactive, and highly radioactive materials. Figure 5 provides a schematic of the 221-T process cells. Process cells are covered with cover blocks. The 'key' cover block must be removed first followed by the remaining cover blocks. These cover blocks are interchangeable with other process cells. In addition, and depending on operations, some cells can have some or all of the cover blocks removed for any given length of time. Additional process cells could be used in the future as a containment building to support waste management activities.

5.3 CONTAINMENT BUILDING

The 221-T Building is permitted as a containment building in accordance with 40 CFR 265, Subpart DD. In addition, seven process cells also are designated and permitted in accordance with 40 CFR 265, Subpart DD, as a containment building. Basically, a containment building allows for the storage, treatment, decontamination, sampling, repackaging, and verification activities of uncontainerized waste. The eleven containment building process cells are as follows:

- Cell 3Left (L)
- Cell 7L
- Cell 8Right (R)
- Cell 9L
- Cell 10L
- Cell 13R
- Cell 13L
- Cell 14R
- Cell 15L
- Cell 16R
- Cell 17R.

5.4 221-T RCRA TANK SYSTEM

In the past, the 221-T *Resource Conservation and Recovery Act* (RCRA) *of 1976* Tank System stored, treated, and transferred liquid mixed waste generated during decontamination activities. The 221-T RCRA Tank System was isolated and permanently removed from service in June 1999 (99-EAP-425). Except for the 211-T collection sump and associated buried piping, the 221-T RCRA Tank System and components are located in the 221-T Building. Tank systems and structures comprising the 221-T RCRA Tank System reside in the following process cells:

- Cell 5L
- Cell 5R
- Cell 6L
- Cell 11R
- Cell 15R.

5.5 221-T RAILROAD TUNNEL

The 221-T Tunnel (Process cell 2L) is used to bring materials and waste in and out of the 221-T Building. The 221-T Tunnel also is used for activities such as storage, treatment, sampling, verification, repackaging and decontamination of waste, equipment, materials, and sludge similar to what could be conducted elsewhere within the 221-T Building, e.g., canyon deck, process cells and head-end.

5.6 OTHER REMAINING PROCESS CELLS

The hazardous and radioactive material in the remaining process cells consists mainly of containerized and uncontainerized waste. This waste resulted from residual contamination on process equipment brought into the facility, chemical residues from previously used decontamination/treatment chemicals/materials, and sludge and liquids generated during previous decontamination/treatment operations contained in original process equipment, waste tanks, and ancillary equipment.

5.7 T PLANT DESCRIPTION

The following sections describe T Plant waste management areas; however, treatment, storage, sampling, verification, repackaging, and decontamination activities can occur anywhere within the TSD unit boundary.

Operational activity waste, transuranic (TRU), low-level, remote, mixed, or similar waste categories, consisting of treatment, storage and/or disposal, failed process equipment including pumps, jumpers, instruments, and containerized and noncontainerized waste, is being retained in some process cells of the 221-T Building. Operational activity waste is subject to cleanup provisions of the Tri-Party Agreement (Ecology et al. 2001).

5.7.1 221-T Building

The 221-T Building is used for decontamination, treatment, sampling, verification, repackaging, and storage of contaminated process equipment and containerized and noncontainerized waste. The 221-T Building is a canyon-type building that began operating in December 1944. The 221-T Building, constructed of reinforced concrete, is 260 meters long, 21 meters wide, and 23 meters high, and covers an area of 5,400 square meters. The floor of the 221-T Building is 1.8 meters thick, the northwest wall is approximately 0.9 meter thick, and the southeast wall is approximately 1.5 meters thick. The building consists of the 'canyon' divided into 20, 12.2 meter sections arranged in a single row running the length of the building; the railroad tunnel; three galleries (operating, pipe, and electrical); and a head-end area. There is an expansion joint between each section. Sections 2 through 20 are divided into cells, each section having a designated (R) and (L) cells. Cells within each section are separated by a 2.1-meter thick reinforced concrete wall. All cells, except 2R, 5R, and the head-end cells, are 5.4 meters long, 4.0 meters wide, and 8.5 meters deep. The standard canyon cells normally are covered by four 1.83-meter thick concrete cover blocks. Each cover block has a carbon steel lifting bail to allow access into the cells. The area on top of the cover blocks is referred to as the 'canyon deck' as well as the surrounding walkways. The canyon deck is approximately 12.2 meters below a 0.9- to 1.2-meter thick concrete roof.

A 41-metric ton capacity master crane moves parallel to the canyon, allowing access to the canyon deck area. This facilitates remote decontamination, maintenance, treatment, and storage activities. The crane maintenance platform, located in Section 20, allows hands-on crane inspection and maintenance.

A 3.2-meter square concrete exhaust air tunnel runs parallel to the canyon and provides exhaust for the canyon cells. The air tunnel exits the 221-T Building at Section 3, 6.7 meters below the deck level where the air tunnel narrows to a 1.2- by 2.1-meter duct. The duct runs approximately 61 meters underground to the high-efficiency particulate air (HEPA) filter system that discharges to the 291-T Stack exhaust system located just southeast of the 221-T Building. Figures 3 and 4 depict the air flow and exhaust pathway from the canyon to the stack. Figure 3 shows the configuration arrangement with Fan #4.

The 221-T Tunnel, the 221-T canyon deck, and the 221-T head-end are waste management areas within the 221-T Building. The 221-T Tunnel is used for transporting equipment and waste into and out of the 221-T canyon.

The 221-T Tunnel provides the area for liquid waste transfer car certifications, repair, decontamination, container storage and loading, verification, treatment, sampling of waste, and repackaging activities.

The structure of the 221-T Building can withstand a tornado having a maximum tangential wind speed of 240 kilometers per hour with a 40-kilometer-per-hour translational speed (or a resultant speed of 280 kilometers per hour). The 221-T building also can withstand a negative pressure loading that results from a 5.2-kilopascal ambient pressure decrease in 3 seconds to a constant held for 1 second and returned to ambient pressure at the same rate. Thus, the structure is able to survive a design-basis tornado.

Fugitive dust emissions are controlled through the use of negative pressure differentials and filters. Contaminated areas are kept at a lower pressure than noncontaminated areas, resulting in airflow from the less contaminated area to the contaminated area, and effectively preventing the release of fugitive emissions. The 221-T canyon ventilation system consists of the 291-T-1 exhaust system for exhausting the main canyon. The HEPA filters on the 291-T-1 exhaust system each must pass dioctyl salicylate aerosol testing requirements of 99.95% efficiency.

The 221-T Building (including the tunnel, canyon deck, process cells) currently is designated as follows:

- Radiation Area
- High Contamination Area
- Contamination Area
- Airborne Radioactivity Area
- High Radiation Area.

These designations are subject to change to reflect future operational and radiological conditions.

Entry requirements for the 221-T Building (including the railroad tunnel, canyon deck, process cells) currently consists of the following:

- Personnel dosimetry (TLD)
- Radiological work permit (RWP)
- Respiratory protection.

These entry requirements are subject to change based on operational conditions at the time of entry.

Continuous air monitors (CAMs) are located throughout the 221-T Building and are used as a tool to protect personnel from radiological conditions that might occur during operations (e.g., packaging of waste, removal of materials from cells, or similar activities). The use of CAMs and the respective set-points are subject to change to reflect operational conditions.

5.7.2 221-T Building Air Flow

The 221-T Building is maintained at a negative differential pressure with respect to the ambient atmosphere. The main exhaust system (located near the 291-T Building) pulls 221-T canyon air past the cell cover blocks down into the cells, through HEPA filters, and out the 291-T Stack.

Extensive requirements are in place to prevent spread of contamination, including administrative access controls and monitoring. Protective clothing or other approved alternatives are required for personnel inside the 221-T canyon, tunnel, and craneway.

Movement of waste or equipment is controlled by monitoring all equipment and/or vehicles that exit the 221-T building and decontaminating as required. Waste to be removed from the 221-T building is containerized, wrapped in plastic, painted with a fixative, decontaminated, free released, or transferred as self-containerized waste. The waste is screened for contamination before leaving the building, and could be held for continued storage or treatment if necessary.

5.7.3 221-T Building Container Management Areas

Waste containers can be stored and treated in the 221-T Building on the canyon deck or in canyon cells, in the tunnel, craneway, and in the head-end. Liquid containers with portable secondary containment and non-liquid containers are placed on the canyon deck, canyon cells, tunnel, craneway, and in head-end, including on cell cover blocks.

5.7.4 221-T Building Railroad Tunnel

The 221-T Tunnel staging area is located within the tunnel that enters the 221-T Building at process cell 2L. The 221-T Tunnel has a 4.9-meter wide by 6.7-meter high opening covered by a motor-driven rolling steel door. Waste and equipment to be stored and/or treated in the 221-T Building are brought into the Tunnel on railcars or in vehicles. Materials are lifted by crane and placed in the desired storage/treatment location. Although normally used only as a transfer and staging area for waste, the 221-T Tunnel can be used for waste storage and treatment.

5.7.5 Head-End

The head-end was partitioned off from the 221-T Building Canyon in 1964. The head-end is used for storage, treatment, decontamination, sampling, repackaging, and verification activities. A sheet-metal wall separates the head-end from the majority of the 221-T Building. The head-end area consists of one large cell, a control room, laboratories, a change room, a maintenance shop, and a large high-bay work area. The cell is 9.8 meters long by 9.8 meters wide by 23 meters high. A containment tent has been erected in the cell area. The purpose of the tent is to allow personnel to perform work without receiving the additional exposure and risk of contamination they would receive in the canyon area. The containment tent is exhausted through the sheet metal wall into the canyon area. There the exhaust is combined with the normal ventilation system where it exhausts through the 291-T-1 exhaust stack.

In 1964, a Containment Systems Experiment Facility (CSEF) was installed in the head-end of the 221-T Building. A large carbon steel containment vessel, 7.6 meters in diameter and 20.4 meters in overall height enclosing 850 cubic meters, was fitted in the space between the cell floor and the canyon ceiling. After the shut down of the CSEF program in 1970, the area was converted in 1975 to a Containment Systems Test Facility (CSTF), which was designed with the unique capability to spill control quantities of liquid sodium into a containment vessel for in-depth testing of emergency air cleaning systems. This vessel is now 'isolated' and out of service. This containment vessel could be used in the future in support of other missions. A control room for the CSTF is located on the second floor (Operating Gallery, Figure 4), and an aerosol sampling laboratory is located on the first floor (Pipe Gallery, Figure 4). This facility has been out of service since 1989 and solidified bulk sodium and the associated storage tanks and piping removed.

The head-end also is used in support of treatment, verification, sampling, repackaging, decontamination, and storage activities.

5.7.6 Building Galleries

The following sections describe the 221-T Building galleries. These areas run parallel with and essentially the length of the canyon structure. Nine stairwells, one at each odd numbered section, connect all of the galleries. These galleries are used for storage of equipment, materials, waste, and recyclable items. The other stairwells are locked to prevent access but allow exit if necessary.

5.7.6.1 Electrical Gallery

The Electrical Gallery (Figure 4), the lowest of the three galleries, is at the same level as the floor of the canyon cells. This gallery is 232 meters long and 4.3 meters wide running parallel to the process cells and contains the main electrical lines, motor control centers, and the electrical distribution centers for the building.

5.7.6.2 Pipe Gallery

The Pipe Gallery (Figure 4), is 232 meters long and 4.3 meters wide at the level just above the Electrical Gallery, but below the level of the canyon deck. This corridor contains most of the nonradioactive chemical, process, and utility piping, and is divided into four areas to meet current operational needs. Section 2 is the location of the main power supply for the ion exchange column. Locker and shower rooms are located in Sections 19 and 20. The laundry dock is located off Section 20. A loading dock is located adjacent to the Section 17 stairwell.

5.7.6.3 Operations Gallery

The Operations Gallery (Figure 4), is 244 meters long and 4.4 meters wide and is the control center for remote operation of the canyon equipment. This gallery is at the level of the canyon deck and the second floor of the 271-T Building. The Shippingport Pressurized Water Reactor (PWR) Core 2 blanket fuel assemblies control panel is located in Section 3. Various control boards are located in Sections 5 through 15; however, of these, only the control panels in 5, 11, and 15 are in use. Sections 16 through 19 contain offices for operations personnel. The office adjacent to Section 19 contains panel controls for canyon air, lights, and other equipment. The canyon entry area and decontamination shower are located at Section 20.

A majority of the original instrumentation panels have been removed and shipped to the Smithsonian Museum for display.

5.7.6.4 Crane Gallery

The Crane Gallery (Figure 4), directly above the Operating Gallery, is approximately 230 meters long and 3.3 meters wide, and is 1 meter above the level of the third floor of 271-T Building. The crane cabway is open to the area above the canyon deck through the space between the top of the parapet wall and the canyon ceiling. The 41-metric ton crane is operated from a crane cab, which is shielded by 7.6 E-2 meter of lead and traverses the crane cabway as the bridge crane moves. Operation of the crane requires the use of installed motor driven periscopes (original optics) and closed circuit television. This crane also can be operated from the crane cab on the crane bridge. Access to the crane cabway from the 271-T Building normally is allowed only at Sections 11 and 13.

5.7.7 271-T Building

The 271-T Building (Figures 2 and 5), is attached to the center of the gallery side of the 221-T Building. This reinforced concrete and cement block structure, 49 meters long, 15 meters wide, and 16 meters high, has three floors and a basement. The basement is at the level of the Electrical Gallery, and contains machine shops, riggers loft, various offices and store rooms, process air compressor room, building ventilation air supply equipment, the bottom halves of chemical makeup tanks, and the related pumps and power switches. The first floor is at the Pipe Gallery level, and provides space for several offices and shops, a lobby, a lunch room, and a restroom. The chemical makeup room contains the three large chemical makeup tanks. The second floor, at the level of the Operating Gallery, contains administrative and supervisory offices and restrooms. The third floor contains several unused chemical makeup tanks, several offices, and a restroom.

5.7.8 221-TA Canyon Air Supply Fans

The 221-TA Building contains two air supply fans for the canyon deck service area. Each fan was rated at 18.9 cubic meters per second and consisted of a preheater, filter, evaporative cooler, and reheater. All of this equipment is deactivated and/or out of service. Makeup air is supplied to the canyon via the 221-TA ductwork and gaps in the 221-T Tunnel rollup door and other personnel doors.

5.7.9 221-T Canyon Exhaust Systems

Negative pressure causes the infiltration of outside air into the canyon. The normal range for this negative pressure in the canyon is between (-)0.15 inch to (-)0.5 inch water gauge and is measured relative to the atmosphere via a static outside air probe located on the 221-T canyon roof. The outside air is drawn into the canyon though the 221-T supply ductwork and through gaps in the 221-T Tunnel rollup door and personnel doors. The 221-T Building has no temperature requirements for the canyon; therefore, there are no heating or cooling components that serve the canyon area.

Air is drawn from the canyon deck down into the cells through gaps in the cover blocks. The exhaust air is routed from the individual cells to a concrete duct, which runs the entire length of the canyon. The exhaust air leaving the canyon fluctuates between 28,000 to 35,000 cubic feet per minute (cfm), and is routed through an underground concrete duct to the four parallel filter banks located near the 291-T-1 exhaust stack. Each bank consists of a prefilter, primary HEPA filter, and a secondary HEPA filter.

Each prefilter housing consists of six 24 inch by 24 inch by 12 inch prefilters rated at 94% efficiency per American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) 52.1 standard, and are encapsulated in disposable filter housings. Each HEPA filter housing has two stages of 24 inch by 24 inch by 12 inch HEPA filters. Each stage has nine filters arranged three filters high by three filters wide. The HEPA filter housings are furnished with aerosol testing devices that allow each HEPA filter stage to be tested. The purpose of the electric heater is to protect the filters from excessive relative humidity.

There are two 291-T-1 exhaust stack fans (Fan #3 and Fan #4), one of which is placed in operation with the other as a backup. Exhaust Fan #3 is rated at 1,132.8 cubic meters per minute (40,000 cfm at 7-inch water gage), draws the exhaust air through the filters, and discharges to the atmosphere via the 291-T-1 concrete stack. Fan #4 is rated at 1,019.5 cubic meters per minute (36,000 cfm at a 12-inch water gage) and discharges through the 291-T-1 exhaust stack. The discharged exhaust air is monitored and sampled in the exhaust stack. The 291-T-1 exhaust stack monitoring system is located in an-all weather, insulated cabinet near the base of the 291-T-1 exhaust stack.

5.8 RADIOACTIVE AIR EMISSION COMPLIANCE FOR THE 221-T BUILDING

The NoC (Notice of Correction) letter (AIR-04-301) has the effect of rendering obsolete previously approved NOCs for fuel removal, 224-T Process Cell characterization, sludge storage, and the Fan #4 replacement, on approval of this consolidated NOC. The following sections discuss 221-T Building compliance with radioactive air emission requirements.

- *Radioactive Air Emissions Notice of Construction for T Plant Fuel Removal Project* (DOE/RL-2000-64 and AIR 01-306). This NOC describes the activities to remove all pressurized water reactor core-2 (PWR-2) SNF assemblies from the spent fuel pool in the 221-T canyon. The spent fuel assemblies will be packaged and transferred to the onsite Container Storage Building (CSB).

- *Radioactive Air Emissions Notice of Construction for Characterization of the 224T Facility Process Cells* (DOE/RL-2001-19 and AIR 02-704). This NOC describes the activities to determine the condition and contents of the 224-T cells, tanks, and vessels. This was not a T Plant NOC but since the 224-T is vented via the 291-T-1 exhaust stack, there is a requirement to account for the radioactive emissions resulting from the activities described therein, and to coordinate any 291-T-1 downtime with the 224-T project.

- *Radioactive Air Emissions Notice of Construction for Storage in T Plant of Sludge from K Basins* (DOE/RL-2001-28 and AIR 02-803). This NOC describes the activities necessary to receive and store sludge removed from K Basins and transferred to the 221-T Building.

  Until such time as the T Plant canyon receives sludge for storage or treatment, the air sampling of emissions from the 291-T-1 exhaust stack is conducted as described in DOE/RL-2000-64 (Fuel Removal NOC). On receipt of sludge, emissions will be sampled in accordance with DOE/RL-2001-28 (sludge NOC) as a major stack.

- *Radioactive Air Emissions Notice of Construction for Exhaust Fan Replacement of the 291-T-1 Stack* (DOE/RL-2002-03 and AIR 02-509). This NOC describes the activities for replacing 291-T-1 exhaust stack Fans #1 and #2 with a new Fan #4. This NOC is relative to this consolidated NOC in that configuration of the exhaust fans changes from previous NOCs.

5.9 GENERAL OVERVIEW

T Plant has been operating since December 1944 (WHC-MR-0452). Numerous activities within the T Plant TSD unit boundary have been conducted, are being conducted, and will continue to be conducted as on-going, normal, routine activities. TRU and mixed wastes are currently being received and processed at T Plant per the Transuranic Waste Retrieval Project, NOC ID: 582, Condition 22. The following sections briefly discuss these on-going, normal, routine activities.

5.9.1 Packaging and Repackaging Waste

Packaging and repackaging activities are performed for waste generated at T Plant as well as for onsite and offsite generators. The repackaging of waste supports waste acceptance criteria for other TSD facilities. For example: (1) prohibited items from waste packages (i.e., waste items that do not meet acceptance criteria) are removed and either staged for later handling or repackaging using remote or manual methods, and (2) low-level waste destined for disposal in the onsite Low-Level Burial Grounds

(LLBG) must have a void space of less than 10%. To meet the less than 10 % requirement, void filler can be added. Packaging and repackaging activities can include the following:

- Sorting
- Segregation
- Removing prohibited items
- Compositing/aggregating solids or liquids
- Adding absorbent
- Size reduction [e.g., cutting (jaws, saws, torches)], bending, folding, crushing (e.g., drum crusher), shredding, compacting, or similar methods that do not have a higher extent of disruption]
- Void filling
- Pressure relief/release (e.g., aerosol cans, gas cylinders, drums, or other similar containers)
- Aerosol can/drum puncturing.

Some packaging of waste (e.g., personal protective equipment, maintenance waste, types of innocuous waste), as a result of surveillances/inspections and maintenance that does not have a potential to create significant airborne contamination, can occur within the 221-T Building when the 291-T-1 exhaust stack emission system is shutdown.

5.9.2 Verification Activities

Verification support activities are provided for waste and other materials that are generated on or off the Hanford Site. Verification activities can consist of the following:

- Physical observation
- Nondestructive examination (NDE)
- Nondestructive assay (NDA)
- Chemical field screening
- Radiological surveys
- Radiological samples
- Headspace gas analysis
- Chemical sampling.

5.9.3 Sampling Activities

Sampling of waste generated by operations or by other onsite or offsite generators is performed. The purpose of sampling is to confirm process knowledge, characterize waste, support verification, and determine land disposal requirements as applicable. Sampling can consist of the following:

- Field screening [e.g., pH paper, oxidizer, volatile organic analyses (VOAs), polychlorinated biphenyls (PCBs), or similar screening parameters]
- Obtaining a sample for analysis [e.g., grab, composite, composite liquid waste sampler (COLIWASA), or other similar sampling techniques]
- Shipping/transferring the samples to an approved laboratory for analysis
- Disposition of sample returns (e.g., placement back into the parent container or another approved container/tank)
- Headspace gas analysis [typically in support of the Waste Isolation Pilot Plant (WIPP) Project]
- Tank sampling (liquid, sludge, salt cake, composites).

5.9.4 Decontamination/Refurbishment Activities

Decontamination activities have been performed since the 1950's. Materials, equipment, and waste can be decontaminated (e.g., free release, reduce the radiological levels, or other similar criteria) using a variety of methods. Decontamination at T Plant can consist of the following:

- Water (fog, high or low-pressure spraying)
- Steam
- Ice blasting
- Vacuum blasting
- Brushing
- Abrasive tools
- Scraping
- Washing (e.g., chemicals/detergents)
- Immersion
- Electro-polishing
- Cutting (e.g., removal by sawing, torching more highly radioactive components or other similar methods)
- Bearing replacement
- Pump and motor alignment

- Electrical repairs

- Rust/paint removal.

In addition, T Plant also performs decontamination of T Plant structural components (e.g., 221-T Building walls, cells, or other similar surfaces).

5.9.5 Maintenance Activities

T Plant is the oldest operating nuclear facility in the world. Because of the age of T Plant, current mission, future mission, support of the cleanup of the Hanford Site, as well as waste and other materials from offsite generators, a variety of preventative and/or repair maintenance activities are performed at T Plant. Some maintenance activities involve the temporary shut down of the 291-T-1 exhaust stack. Maintenance activities can consist of the following:

- Painting

- Crane maintenance

- Electronic systems functional checks and repairs [e.g., CAMs, personnel contamination monitors (PCMs), or other similar equipment]

- Calibrations

- Rollup doors

- Heat pumps

- Exhaust fans

- Transformers

- Scale systems

- Wire rope

- Stack systems (e.g., fan lubes or other similar maintenance activities)

- Forklifts.

Certain maintenance activities (e.g., wire rope inspections, lubrication, functional tests, calibrations, or similar innocuous activities) that do not have a potential to generate significant airborne contamination can occur within the 221-T Building when the 291-T-1 exhaust stack emission system is shutdown.

5.9.6 Waste Treatment Activities

T Plant is a treatment facility permitted by the Washington State Department of Ecology (Ecology). Treatment activities can consist of the following:

- Macroencapsulation
- Absorption
- Neutralization
- Immobilization
- Encapsulation
- Stabilization (e.g., solidification, cementation, grouting, or other similar methods)
- Compaction
- Amalgamation
- Segregation
- Shredding
- Venting
- Size Reduction.

5.9.7 Recycling Activities

Materials are recycled whenever possible. Recycled materials are collected in accumulation containers in approved locations and transferred to the Recycling Center. Only nonradioactive materials are sent to the Recycling Center. Some radioactive materials (ferrous and nonferrous metals) can be recycled. These radioactive recycling materials can be reused on the Hanford Site or shipped to an approved offsite facility for reclamation and/or reuse. Examples of recycling materials can consist of the following:

- Ferrous metal
- Nonferrous metal
- Light bulbs (e.g., sodium, mercury, incandescent, fluorescent, or similar types)
- Aerosol cans
- Oils
- Batteries (e.g., lead-acid, alkaline, lithium, or similar types).

5.9.8 Storage Activities

T Plant is permitted for waste storage by Ecology. T Plant also stores other materials (e.g., chemicals, equipment, or similar materials) to support operations. Storage can consist of the following:

- Containerized (e.g., boxes, drums, tanker trucks/railcars, large diameter containers, or similar containers) and uncontainerized waste and/or materials meeting waste acceptance criteria

- Tank storage

- Equipment storage

- Collection and storage within sumps and pipes.

5.9.9 Equipment, Materials, and Waste Movement Activities

The movement of materials, equipment, waste, chemicals, or similar items involves the receipt and/or transferring/shipping, and the movement and/or relocation within the T Plant TSD unit boundary. The movement of these items is necessary to support operations, maintenance, or similar activities.

Movement activities (e.g., using a forklift, crane, truck, dolly, personnel, or similar equipment) can consist of, but is not limited to, the following:

- Receiving waste (e.g., liquid, solid, semi-solid,) for storage and/or treatment

- Movement of waste (e.g., liquid, solid, semi-solid) and equipment in or out of process cells, canyon deck craneway, or tunnel in the 221-T Building

- Movement of liquids, sludges, or other waste from containers and/or tanks via transfer lines

- Waste container transfers (among outdoor storage pads, within buildings, process cells, canyon deck, or other approved locations)

- Placing and storing chemical products in flammable cabinets or other approved storage locations

- Transloading from the 221-T tunnel to canyon deck and/or process cells.

5.9.10 Housekeeping Activities

Housekeeping activities involve maintaining T Plant in a clean and orderly condition. Housekeeping activities can consist of, but are not limited to, the following:

- Sweeping (e.g., brooms)
- Mopping (e.g., squeegees or other similar techniques)
- Vacuuming
- Dusting
- Wiping (e.g., sponges, towels, or other similar methods)
- Picking up debris
- Removal of trash.

5.9.11 Surveillance Activities

Surveillance activities involve walking down and inspecting various areas, systems, and components. Surveillances typically consist of daily, weekly, and monthly inspections of waste containers, tanks, buildings, or similar locations. Surveillances are subject to change (adding, deleting and/or modifying) as operations, maintenance, engineering, and radiological control dictates. The following are examples of surveillances currently performed at T Plant:

- Container storage areas (buildings, pads, conex boxes, or other similar locations)

- Treatment and storage tanks and ancillary equipment

- General condition of building structures

- Safety equipment (e.g., safety showers, eye wash stations, first aid kits, fire extinguishers, fire suppression systems, communication equipment, spill kits, emergency lighting, Scott Air-Pak®, personnel contamination monitors, masks)

Scott Air-Pak® is a registered trademark of Scott Aviation Inc.

- Cold weather surveillances (typically done between October 1 and March 31)

- Inspection of equipment (e.g., 291-T-1 exhaust stack cabinet and exhaust fans, differential pressure gauges, or similar equipment)

- Inspection of HEPA filtered vacuums

- Radiological surveys.

Surveillances, inspections, and maintenance activities that do not have the potential to create airborne contamination can occur within the 221-T Building when the 291-T-1 exhaust stack emission system is shutdown.

5.9.12 Contamination Within the Canyon

The operational activities described inherently involve the spread of contamination within the canyon. Preparations are made for possible spread of contamination to minimize impacts (spreading paper to facilitate easy decontamination, fogging, fixing contamination, covering, performing operations remotely or other similar methods that cover, seal, or remove smearable contamination). Contamination levels within the canyon vary considerably as work evolutions for these operational activities proceed. Changes in contamination levels within the canyon are important for subsequent entry requirements and decontamination, rather than indicators for environmental release or loss of containment. The canyon is designed to provide containment for these operational activities. The spread of contamination within the 221-T Building is avoided as much as possible. However, contamination is anticipated to occur as part of routine operations (e.g., waste handling/processing activities).

5.10 RADIOACTIVE WASTE THROUGHPUT

The following section discusses the estimated volumes of radioactive waste and other materials that might be managed at T Plant. This section represents the maximum amount of waste or materials managed at T Plant. Throughput from other generators is bound by volume and zone limitations as discussed.

T Plant does not have a specified limit in the form of number of containers of radioactive waste (e.g., low-level, TRU, mixed) that can be stored, decontaminated, or treated at any given time. Storing, decontaminating, and treating radioactive waste are based on dose equivalent curie (DE-Ci) limits established for the facility and the various 'zones' within the TSD unit boundary (HNF-14741 and HNF-15280). Currently, the T Plant limit is 7,850 DE-Ci, and the following zones are in place; however the number and location of zones are subject to change in support of operational needs/activities.

Zone Number	Primary Zone/Description	Secondary Zone/Description
1	221-T Tunnel	Individual storage or treatment areas separated by 10 meters (m) or a fire barrier.
2	221-T Canyon	
2A (2A1, 2A2, etc.)		Each isolated cell.
2B		Decontamination waste system.
2C (2C1, 2C2, etc.)		Individual storage or treatment areas separated by 10 m or a fire barrier.
2D		221-T head-end.
8	291-T HEPA filters and 221-T ventilation system	

Waste containers or equipment for which there is no physical mechanism for release or interaction with other materials (e.g., containers of grouted radioactive material) could be included in most zones, but does not count against zone inventory limits. The fuel assemblies do not count against the zone limits and are not included in the facility limit of 7,850 DE-Ci because they are a solid.

During the actual treatment process, the material will count against the zone limits, as determined by appropriate packaging factors established by the safety organization.

Estimates for throughput capacity are described further in Section 10.0 and Appendix B. An estimate of maximum annual throughput is 15,000 DE-Ci, nearly double the 221-T Building limit of 7,850 DE-Ci. As a precedent, the permitted Ci (converted to DE-Ci) throughput in the Waste Receiving and Processing (WRAP) Facility NOC (DOE/RL-2000-34) is nearly double the corresponding WRAP Building DE-Ci limit. This estimate of 15,000 DE-Ci is consistent with projected activities at T Plant and is adequate to bound all ongoing and proposed activities at T Plant other than the fuel removal (Appendix D) and sludge storage/treatment activities (Appendix E).

6.0 PROPOSED CONTROLS

Describe the existing and proposed abatement technology. Describe the basis for the use of the proposed system. Include expected efficiency of each control device, and the annual average volumetric flow rate in cubic meters/second for the emission unit.

The existing 221-T ventilation system will be used (291-T-1 exhaust stack). Two stages of HEPA filters are tested in place annually at a minimum control efficiency of 99.95% for each stage. Currently, the annual average flow for the 291-T-1 exhaust stack is 40,000 cfm using maximum design fan capacity as an approved alternative method for measuring flow (AIR 03-1208 and EPA 2003). When the 291-T-1 exhaust stack is declared a major stack, on receipt of sludge or due to the accumulation of enough PTE to meet major stack criteria due to operational activities, the stack will operate as described in Section 9.0 of this NOC.

Many of the emission controls used during activities are administrative, based on as low as reasonably achievable (ALARA) principles and consist of ALARA techniques. It is proposed that these controls satisfy as best available radioactive control technology (BARCT) for the activities at T Plant. Operations will be performed in accordance with the controls specified in RWPs and/or operating procedures. These controls can consist of the following.

- Health physics technician (HPT) coverage will be provided, as necessary, during evolutions, including fuel, sludge, or container movement activities. The monitoring systems for registered stacks will be operational during normal activities. Appropriate controls such as water, fixatives, covers, or containment enclosures will be applied, if needed, as determined by the Radiological Control organization. The 291-T-1 exhaust stack ventilation system will be operational at all times except for planned maintenance and outages. No activities requiring confinement ventilation would be conducted during these outages the repair activity.

- As appropriate, before starting movement activities (such as fuel removal, sludge storage or containers), removable contamination in the affected area(s) will be reduced to ALARA. Measures such as decontamination solutions, expandable foam, fixatives, or glovebags also could be used to help reduce the spread of contamination.

7.0 DRAWINGS OF CONTROLS

Provide conceptual drawings showing all applicable control technology components from the point of entry of radionuclides into the vapor space to release to the environment.

Figure 1. Hanford Site
Figure 2. Location of T Plant Complex and the 291-T-1 Stack in the 200 West Area
Figure 3. Fan #4 Schematic
Figure 4. Air flow from the Canyon to the Stack
Figure 5. Schematic of T Plant Complex Process Cell Locations.

8.0 RADIONUCLIDES OF CONCERN

Identify each radionuclide that could contribute greater than ten percent of the potential-to-emit TEDE to the MEI, or greater than 0.1 mrem/yr potential-to-emit TEDE to the MEI.

The radionuclides of concern exist as particulates. Specifically, those contributors of greater than 10% of the PTE are Sr-89/90, Cs-137, Pu 239/240, Am-241. This assumption provides a conservative estimate of the PTE from the stack. Other radionuclides expected to be encountered are Cm-242, Am-243, Cm-244, Co-60, Cs-134, Eu-154, H-3, K-40, Nb-94, Np-237, Pu-238, Pu-241, Pu-242, Pu-244, Ra-226, Ru-106, Sb-125, Th-228, Th-234, U-232, U-233, U-234, U-235, U-236, and U-238. In addition, essentially any radionuclide isotope could be encountered.

These radionuclides represent the radionuclides present in the waste stream, many of which previously existed at T Plant (Appendix B). These are not inclusive of all radionuclides that could be encountered on the Hanford Site and/or received from offsite locations.

Any radionuclide on the chart of the nuclides could be present or received at T Plant in the future. Although any radionuclide could be present, for conservatism all beta/gamma is assumed to be Cs-137 and all alpha is assumed to be Am-241 for dose calculation estimates.

9.0 MONITORING

Describe the effluent monitoring system for the proposed control system. Describe each piece of monitoring equipment and its monitoring capability, including detection limits, for each radionuclide that could contribute greater than ten percent of the potential to emit TEDE to the MEI, or greater than 0.1 mrem/yr potential to emit TEDE to the MEI, or greater than twenty-five percent of the TEDE to the MEI, after controls. Describe the method for monitoring or calculating those radionuclide emissions. Describe the method with sufficient detail to demonstrate compliance with the applicable requirements.

The proposed operations will be subject to the continuous monitoring requirements specified in 40 CFR 61.93 and WAC 246-247-075. In accordance with these requirements, continuous monitoring will be performed to verify emissions and to support an estimate of the quantity of those emissions for annual reporting purposes. The record sampler for the 291-T-1 exhaust stack currently is operated continuously, and particulate air filters are collected biweekly and analyzed for total alpha and total beta.

Samples are composited quarterly and analyzed for the following parameters: Gamma-energy analysis, Sr-90, isotopic Pu, Pu-241 and Am-241. Sample analyses are maintained in the Automated Bar Coding of Air Samples at Hanford (ABCASH) database. The detection limits for the radionuclides that could contribute greater than 10% of the PTE are 2.0E-15 μCi/ml (total alpha) and 1.9E-14 μCi/ml (total beta).

10.0 ANNUAL POSSESSION QUANTITY

Indicate the annual possession quantity for each radionuclide.

The total PTE for this NOC is based on 15,000 DE-Ci/yr and is 4.9E+04 Ci/yr. The container DE-curie DE-Ci limit for T Plant is bounding regardless of the origin of the container, whether the container comes from Central Waste Complex (CWC), WRAP Facility, LLBG or TRU retrieval, and other generators. Each container is required to have a DE-Ci value assigned in the Solid Waste Information Tracking System (SWITS). The DE-Ci limit is tracked by T Plant Operations to ensure the limit is not exceeded.

T Plant can handle any radionuclide listed in the periodic table at any time. Activities might or might not be concurrent. When an activity contained in any of the appendices is completed, the activity can be considered obsolete. This includes the baseline and all other processes as shown in Appendices A through E.

The contributing PTE from each process is summarized for the five appendices as follows.

Appendix A - Baseline operations account for 1.6 E-3 DE-Ci/yr (4.2E-03 Ci/yr) unabated release. This amount only applies to the ongoing T Plant operations during the interim period of waiting for approval of this consolidated NOC, consistent with guidance from WDOH (AIR 03-601) that "the ongoing day-to-day routine activities may continue while the As Low As Reasonably Achievable Control Technology (ALARACT) demonstration is developed and reviewed." By extension, this understanding applies to the current operations during the period of review and approval of this consolidated NOC application. Once this consolidated NOC is approved, Appendix A becomes obsolete.

Appendix B - Ongoing and proposed future activities are bounded by the 1.5E+4 DE-Ci/yr (4.9E+04 Ci/yr). Although each of the previous NOCs have been based on a wider range of radionuclides, Appendix B uses four radionuclides (Sr-90, Cs-137, Pu-239/240, and Am-241) to conservatively represent the entire range of possible radionuclide inventories. When Appendices A, C, D, and E become obsolete, the 1.5 E+4 DE-Ci/yr limit in Appendix B remains as the total for this consolidated NOC. With or without the other Appendices, 1.5 E+4 DE-Ci/yr is the total for this NOC, as the DE-Ci for the other Appendices drop out when considering only two significant digits.

Appendix C - The 224-T inventory of 3.5 E+1 DE-Ci/yr (6.2 E+01 Ci/yr) is found in the 224-T process cells characterization NOC (DOE/RL-2001-19, Rev. 1, Table 1) and consists of the inventory estimate that has a pathway to the 291-T-1 exhaust stack, further described in Appendix C. When the 224-T Building is isolated from the 291-T-1 exhaust stack, Appendix C will become obsolete.

Appendix D – The fuel inventory (9.0 E+4 De Ci) is considered to be a solid, normalized to 90 DE-Ci/yr as described in Appendix D. The crud inventory is described in the fuel removal NOC (DOE/RL-2000-64, Rev. 1) and consists of the crud adhered to the outer surface of the fuel assemblies (5.4 E-4 DE Ci). Over three-fourths of the fuel assemblies have been removed from the facility to date, further described in Appendix D. When fuel removal is complete, Appendix D will become obsolete.

Appendix E - Appendix E is limited to the sludge fraction associated with the North Load-Out Pit (NLOP). The NLOP inventory corresponds to 3.6 E+1 DE-Ci/yr (4.8 E+02 Ci/yr) which is not significant compared to the 1.5 E+4 DE-Ci total for Appendix B.

11.0 PHYSICAL FORM

Indicate the physical form of each radionuclide in inventory: Solid, particulate solids, liquid, or gas.

All the radionuclides listed in Section 10.0 are present as particulate solids at ambient conditions.

12.0 RELEASE FORM

Indicate the release form of each radionuclide in inventory: Particulate solids, vapor, or gas. Give the chemical form and ICRP 30 solubility class, if known.

All the radionuclides listed in Section 10.0 are released as particulate solids (gaseous radionuclide contributions are inconsequential).

13.0 RELEASE RATES

Give the predicted release rates without any emissions control equipment (potential to emit) and with the proposed control equipment using the efficiencies described in subsection (6) of this section. Indicate whether the emission unit is operating in a batch or continuous mode.

The predicted unabated (without any emissions control equipment) release rates and abated release rates for each radionuclide in Section 10.0, are presented in Appendix B, Table B-2 using the appropriate WAC 246-247-030 (21)(a) release fractions (1.0 E-3 for particulate solids).

Actual emissions for 2003 from the 291-T-1 exhaust stack were 4.0 E–05 Ci of total alpha and 7.4 E-05 Ci of total beta/gamma (DOE/RL-2004-09). Although the 291-T-1 exhaust stack will operate in continuous mode, the proposed activities in this NOC are not expected to result in a significantly measurable change of actual emissions from the 291-T-1 exhaust stack.

14.0 LOCATION OF MAXIMALLY EXPOSED INDIVIDUAL

Identify the MEI by distance and direction from the emission unit.

The MEI from T Plant is located at the Laser Interferometer Gravitational Wave Observatory (LIGO), approximately 18.3 kilometers east southeast of the Reduction Oxidation Facility (S Plant), conservatively chosen to represent 200 West Area. Dose estimates for unit Ci releases of selected radionuclides were calculated for emissions from the 200 West Area. These dose estimates were calculated for an onsite member of the public working at LIGO, who works within the Hanford Site boundary, and who eats food grown regionally.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL

Calculate the TEDE to the MEI using an approved procedure. For each radionuclide identified in sub section (8) of this section, determine the TEDE to the MEI for existing and proposed emission controls, and without any existing controls using the release rates from subsection 13 of this section. Provide all input data used in the calculations.

The total abated PTE for all activities in this NOC is: 5.6 E-02 mrem/yr. The unabated PTE for all activities in this NOC is: 1.2 E+02 mrem/yr. These values are shown in Appendix B, Table B-2. This includes the baseline and all other processes as shown in Appendices A through E.

The individual PTEs are as follows:

Appendix A: Baseline PTE: The abated PTE associated with the baseline is: 5.7 E-06 mrem/yr. The unabated PTE is: 1.2 E-02 mrem/yr to the MEI.

Appendix B: Ongoing and Proposed Activities: The abated PTE associated with these activities is: 5.60 E-02 mrem/yr. The unabated PTE is: 1.20 E+02 mrem/yr to the MEI.

Appendix C: 224-T NOC: The abated PTE associated with this NOC is: 8.3 E-03 mrem/yr. The unabated PTE is: 8.3 E-03 mrem/yr to the MEI.

Appendix D: Fuel Removal NOC: The abated PTE associated with this NOC is: 8.00 E-09 mrem/yr. The unabated PTE is: 1.60 E-05 mrem/yr to the MEI.

Appendix E: Sludge Storage NOC: The abated PTE associated with this NOC is: 1.3 E-04 mrem/yr. The unabated PTE is: 2.6 E-01 mrem/yr to the MEI.

16.0 COST FACTORS OF CONTROL TECHNOLOGY COMPONENTS

Provide cost factors for construction, operation and maintenance of the proposed control technology components and the system, if a BARCT or ALARACT demonstration is not submitted with the NOC.

WDOH has provided guidance that HEPA filters generally is considered BARCT for particulate emissions (AIR 92-107). Control technology that meets BARCT requirements also meets ALARACT requirements. Since the radionuclides of concern are particulates, it is proposed that the controls described in Section 6.0 for the 291-T-1 exhaust stack be accepted as BARCT.

Cost factor inclusion is not applicable. The proposed activity is a significant modification to existing facilities, using attendant existing ventilation systems which will remain operational during activities. The ventilation systems use HEPA filtration, which is recognized as BARCT.

Cost factors for construction, operation, and maintenance of proposed technology requirements are not provided, as the BARCT demonstration already has been submitted (WHC-SD-W026-TI-004).

17.0 DURATION OR LIFETIME

Provide an estimate of the lifetime for the facility process with the emission rates provided in this application.

Activities are scheduled to be initiated in Calendar Year 2004 and be completed by December 2028. This date could be extended to support on-going or new missions.

18.0 STANDARDS

Indicate which of the following control technology standards have been considered and will be complied with in the design and operation of the emission unit described in this application:

ASME/ANSI AG-1, ASME/ANSI N509, ASME/ANSI N510, ANSI/ASME NQA-1, 40 CFR 60, Appendix A Methods 1, 1A. 2, 2A, 2C, 2D, 4, 5, and 17, and ANSI N13.1

For each standard not so indicated, give reasons to support adequacy of the design and operation of the emission unit as proposed.

A technology standards assessment has been performed to demonstrate that the substantive requirements of the standards are met. A matrix of the requirements, any deviations from the standards, and justification for any deviations are provided in the assessment, which demonstrates the status of conformance by the ventilation and monitoring systems.

The abatement control system for the 291-T-1 Stack was installed in the early 1990's before this requirement for control technology standards was specified in WAC 246-247 (April 1994). Although the listed technology standards, if available at time of construction, might have been followed as guidance, there was no regulatory requirement for compliance with the listed standards. Operational history, routine maintenance, testing, and inspections (ANSI N509 and N510) demonstrate adequacy of the design and operation of the existing abatement control technology as proposed.

A recent installation of Fan #4 and associated ductwork was performed during the summer of 2004, with acceptance testing being completed in August 2004. Fan #4 and the associated ductwork was included in the technology standards assessment.

ASME/ANSI AG-1:

The initial 291-T-1 Stack and ventilation system were built before compliance with the code was required. Regarding the section in AG-I on HEPA filters, the HEPA filters in the ventilation system for the 291-T-1 Stack meet all but two criteria dealing with filter qualification testing. Justification for these sitewide exceptions was discussed with and approved by WDOH at the December 1998 Routine Technical Assistance Meeting. A WDOH approved temporary deviation currently is in place to satisfy this issue (WDOH AIR 99-507). Other sections in AG-1 for the initial system either are not applicable (e.g., adsorbers or moisture separators) or are addressed under ANSI N509.

In 2001 the pre-filters were replaced-in-kind, with pre-filters and housings which had procurement specifications designed to meet requirements of AG-1. The original two fans (1940's vintage) were replaced in 2004 by the project to install Fan #4 and associated ductwork. The project specifications were designed to meet applicable sections of AG-1. The preliminary assessment of the project is that the substantive requirements of AG-1 are met. Minor deviations from the standards are addressed in the technology standards assessment to demonstrate adequacy of the design.

ASME/ANSI N509:

The HEPA filters conform to ANSI N509, Section.5.1. Documentation to show full compliance with the remaining sections of ANSI N509 cannot be provided. Instead, the following information is provided to support adequacy of design.

The 291-T-1 ventilation system was built when Hanford Plant Standard (HPS-157-M), Standard Specification for Fire- and Moisture- Resistant Nuclear Grade HEPA Filters, was in effect that covered fire resistance, moisture resistance, filter efficiency (penetration), flow resistance, and filter frame integrity. Although vendor provided documentation does not reference ANSI N509, many aspects of N509 requirements were considered in the design, evidenced by certifications for materials, welds, and housing leak tests.

Adequacy of the HEPA filters and housings has been demonstrated by operational history and successful testing in accordance with guidance provided in ASME/ANSI N510. The existing system has been successfully tested annually in its pre-2004 configuration since 1995. Aerosol testing of the ventilation system as shown in Figure 4, with the new fan configuration, commenced in 2004.

ASME/ANSI N510:

As allowed in ASME/ANSI N510, certain sections of N510 may be used as technical guidance for non-N509 systems. To demonstrate the adequacy of the system design and operation, both stages of HEPA filters are aerosol tested individually in-place annually (at a minimum control efficiency of 99.95 percent) to meet the intent of ANSI N510. This annual testing includes a visual inspection of the housing as described in ANSI N510.

ANSI/ ASME NQA-1:

NQA-1 sections addressing abatement technology components design were not applicable during system construction and so are not addressed. Quality assurance for sampling of emissions and subsequent analysis is addressed in HNF-0528-3, NESHAP Quality Assurance Project Plan for Radioactive Airborne Emissions (all of Sections 2.0,3.0 and 5.0), which was written in accordance with applicable NQA-1 requirements.

40 CFR 60. Appendix A

An approved alternative method has been approved for measuring flow (AIR 03-1208 and EPA 2003).

ANSI N13.1:

The sampling system complies with ANSI N13.1 (1969) criteria. The stack probe, a rake design with 10 nozzles, was installed in the mid-1980's. The nozzles do measure equal annular area as described in the standard. The probe location is a minimum of five stack diameters downstream from abrupt changes in flow direction. Sample tubing and number of bends are minimized as much as physically practical. The probe was designed to provide near isokinetic sampling at a given stack flow. The stack will be operated to maintain near isokinetic sampling. Currently the sample system is operated to provide continuous monitoring as described in Section 9.0. Adequacy of the sampling system is demonstrated by inspection, calibration, and maintenance activities as scheduled in current facility procedures.

19.0 REFERENCES

99-EAP-425, Letter J.E. Rasmussen (DOE-RL) to R.J. Julian (Ecology), "Request to Extend the Time for Waste Removal and Closure of the 221-T Tank System, as per Washington Administrative Code (WAC) 173-303-610 (4) (c)", August 2, 1999.

AIR 92-107, Letter, WDOH to DOE-RL, "Surveillance Report Generated by the DOH of KE & KW Basin on 09/16/1992", October 05, 1992.

AIR 99-507, Letter, WDOH to DOE-RL, "Technical Justification for Temporary Deviation to American Society of Mechanical Engineers (ASME) AG-1, Section FC 5100 High Efficiency Particulate".

AIR 99-1102, Letter WDOH to DOE-RL, Washington State Department of Health (WDOH) Conditions and Limitations for the "Portable Temporary Radioactive Air Emissions Units", DOE/RL-95-75, Revision 2.

AIR 01-306, Letter, Washington State Department of Health (WDOH) Conditions and Limitations for the "Radioactive Air Emissions Notice of Construction for the T Plant Complex Fuel Removal Project", DOE/RL-2000-64, Revision 1.

AIR 02-509, Letter, Washington State Department of Health (WDOH) Conditions and Limitations for the "Radioactive Air Emissions Notice of Construction for Exhaust Fan Replacement of the 291-T-1 Stack", DOE/RL-2002-03, Revision 1.

AIR 02-704, Letter, Washington State Department of Health (WDOH) Conditions and Limitations for the "Radioactive Air Emissions Notice of Construction for Characterization of the 224T Facility Process Cells", DOE/RL-2001-19, Revision 1 and Revision 1C, NOC ID 500.

AIR 03-601, Letter, Washington State Department of Health (WDOH) "the ongoing day-to-day routine activities may continue while the ALARACT demonstration is developed and reviewed." A.W. Conklin (WDOH) to J.B. Hebdon (DOE-RL), June 2, 2003.

AIR 02-803, Letter, Washington State Department of Health (WDOH) Conditions and Limitations for the "Radioactive Air Emissions Notice of Construction (NOC) for Storage in T Plant Complex of Sludge from K Basins", DOE/RL-2001-28, Rev. 1A, NOC ID 445, December 9, 2003.

AIR 03-1208, Letter, Washington State Department of Health (WDOH) Conditions and Limitations for the "Radioactive Air Emissions Notice of Construction (NOC) for Storage in T Plant Complex of Sludge from K Basins", DOE/RL-2001-28, Rev. 1A, NOC ID 445, August 8, 2002.

AIR-04-301, Notice of Correction Letter, Washington State Department of Health (WDOH) to J.B. Hebdon (DOE-RL), March 2, 2004.

DOE/RL-2000-34, *Radioactive Air Emissions Notice of Construction Application For the Waste Receiving and Processing Facility*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-64, "Radioactive Air Emissions Notice of Construction for the T Plant Complex Fuel Removal Project", Revision 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-19, "Radioactive Air Emissions Notice of Construction for Characterization of the 224T Facility Process Cells", Revision 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-28, "Radioactive Air Emissions Notice of Construction for Storage in T Plant Complex of Sludge from K Basins", Revision 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-57, Rev. 2A, "Radioactive Air Emissions Notice of Construction for the Transuranic Waste Retrieval Project", U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-64, "Radioactive Air Emissions Notice of Construction for the T Plant Complex Fuel Removal Project", Revision 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2002-03, "Radioactive Air Emissions Notice of Construction for Exhaust Fan Replacement of the 291-T-1 Stack", U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2004-09, "Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2003", U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE-RL, 2001, *Hanford Federal Facility Agreement and Consent Order*, Washington State Department of Ecology, U.S. Environmental Protection Agency, U.S. Department of Energy, Richland Operations Office, Olympia, Washington, amended periodically.

EPA, 2003, "Approval of Alternative Flow Measurement Method for 291-T-1 Stack", Letter to J. B. Hebdon (DOE-RL) from B Wiese (EPA, Region 10) dated 3-26-2003.

HNF-14741, "Waste Management Project (WMP) Master Documented Safety Analysis (MDSA) for the Solid Waste Operations Complex (SWOC)", Fluor Hanford, Richland, Washington.

HNF-15280, "Technical Safety Requirements (TSRs) for the Solid Waste Operations Complex (SWOC)", Fluor Hanford, Richland, Washington.

HNF-17211, "As Low As Reasonably Achievable Control Technology Demonstration for the T Plant Complex", Fluor Hanford, Richland, Washington.

HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, Fluor Hanford, Richland, Washington.

HNF-EP-0528-3, "NESHAP Quality Assurance Project Plan for Radioactive Air Emissions Data", Fluor Hanford, Richland, Washington, September 1993.

HNF-SD-SNF-TI-009, "105-K Basin Material Design Feed Basis Description for Spent Nuclear Fuel Project Facilities", Fluor Hanford, Richland, Washington.

HPS-157-M, "Standard Specification for Fire- and Moisture-Resistant Nuclear Grade HEPA Filters".

WHC-MR-0452, *Dramatic Change at T Plant*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-W026-TI-004, *Waste Receiving and Processing Module 1 Facility, Technical Background Document for Best Available Radionuclide control Technology Demonstration*, Westinghouse Hanford Company, Richland, Washington.

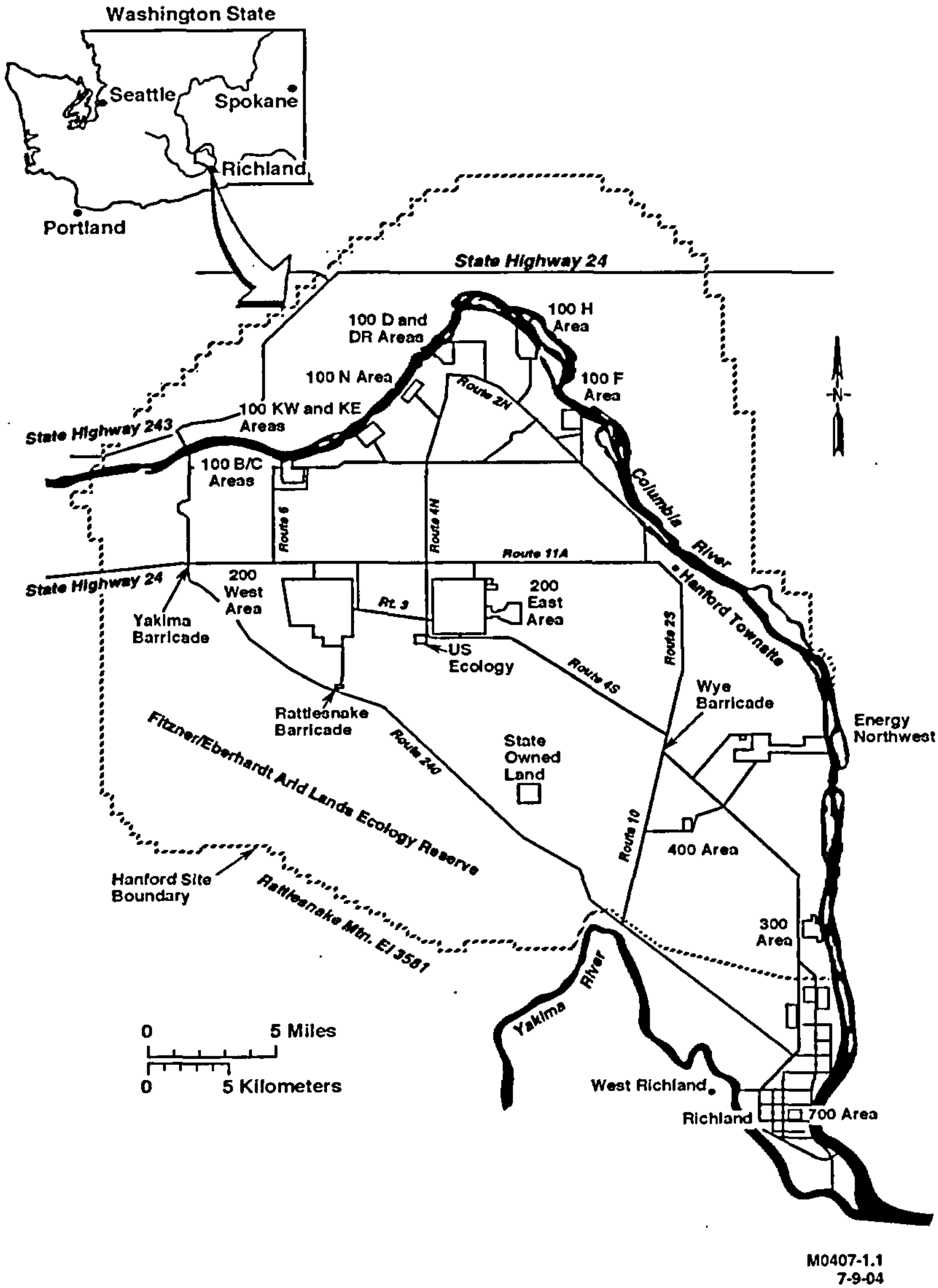


Figure 1. Hanford Site.

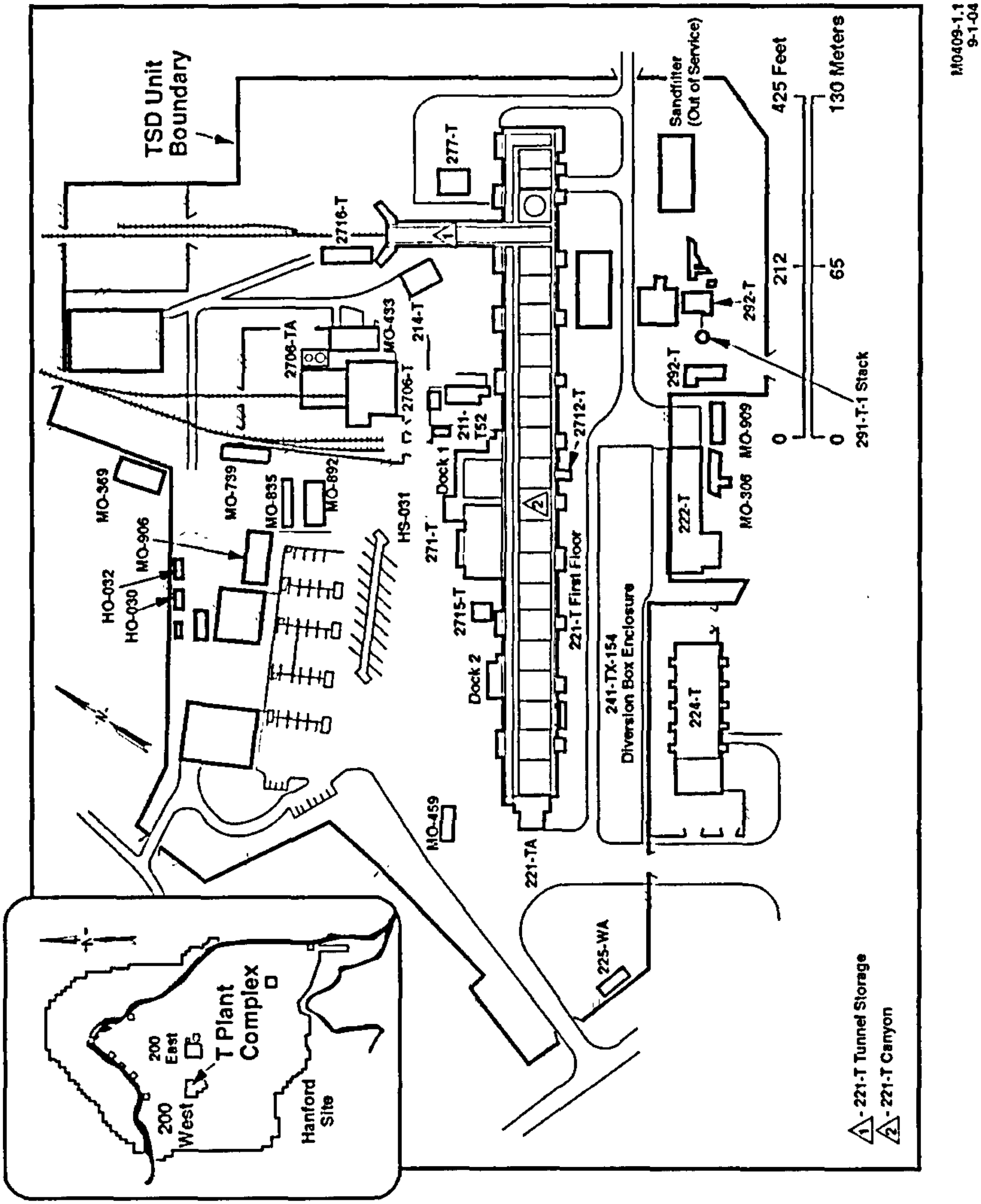


Figure 2. Location of T Plant Complex and the 291-T-1 Stack in the 200 West Area.

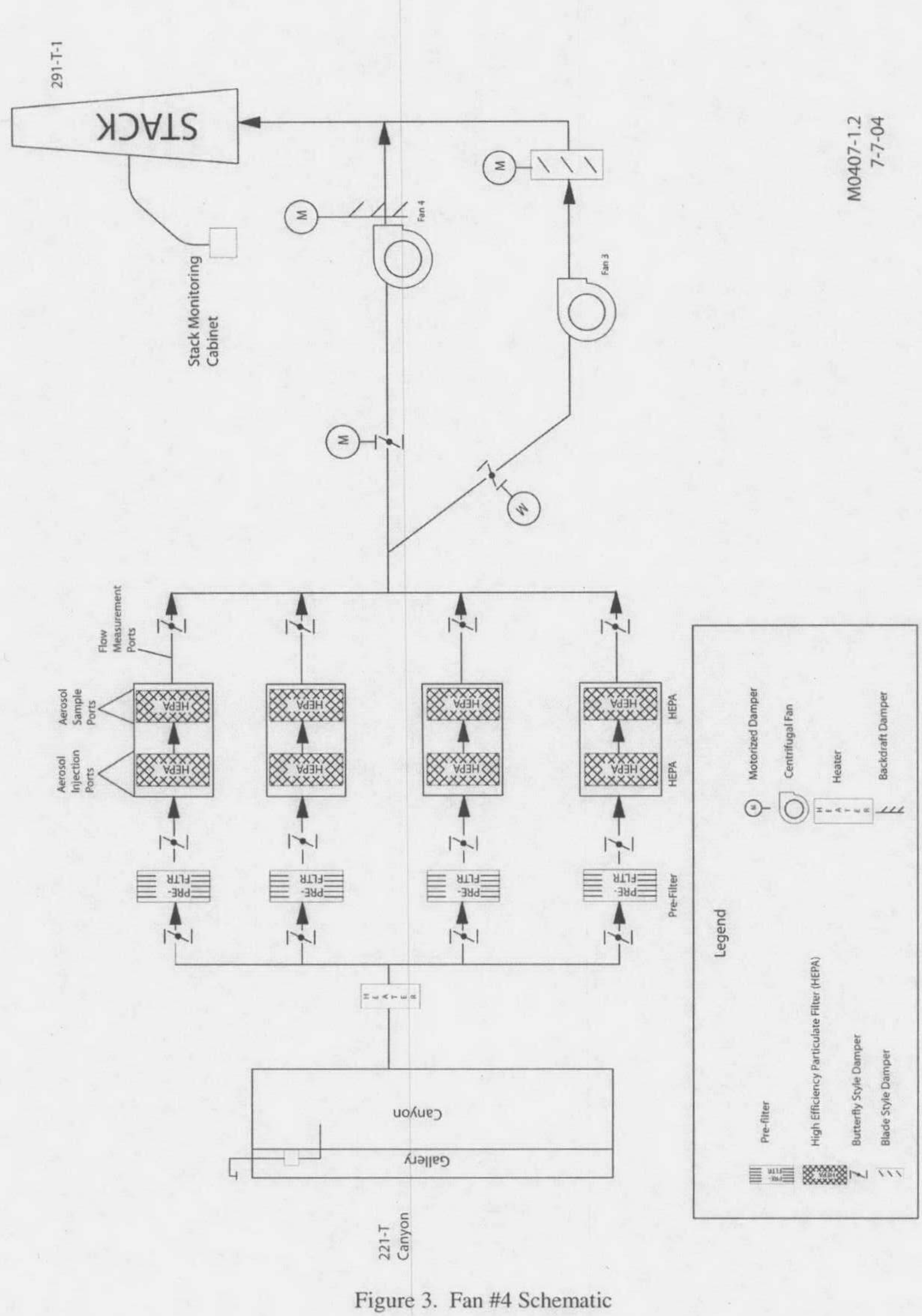


Figure 3. Fan #4 Schematic

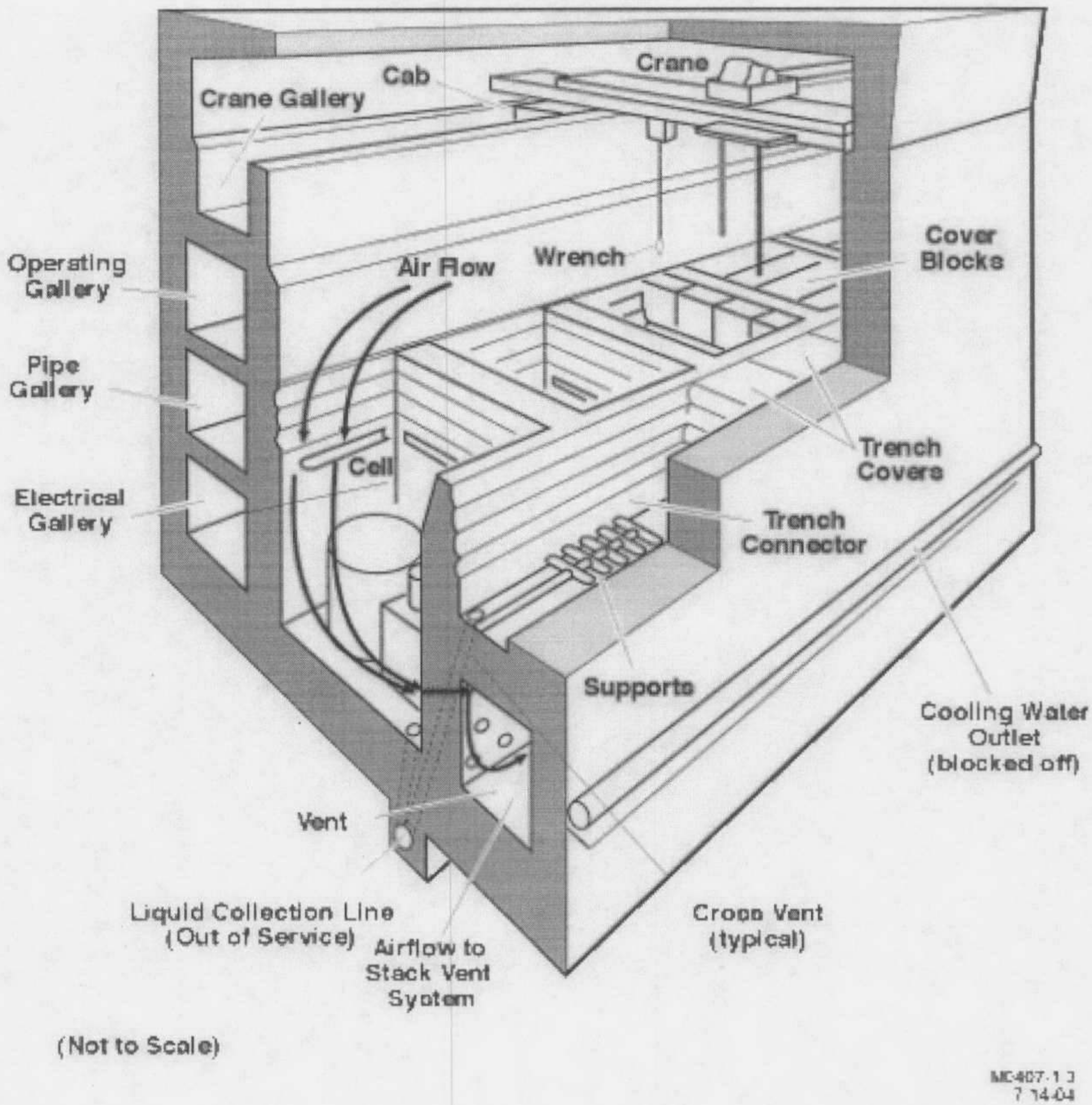
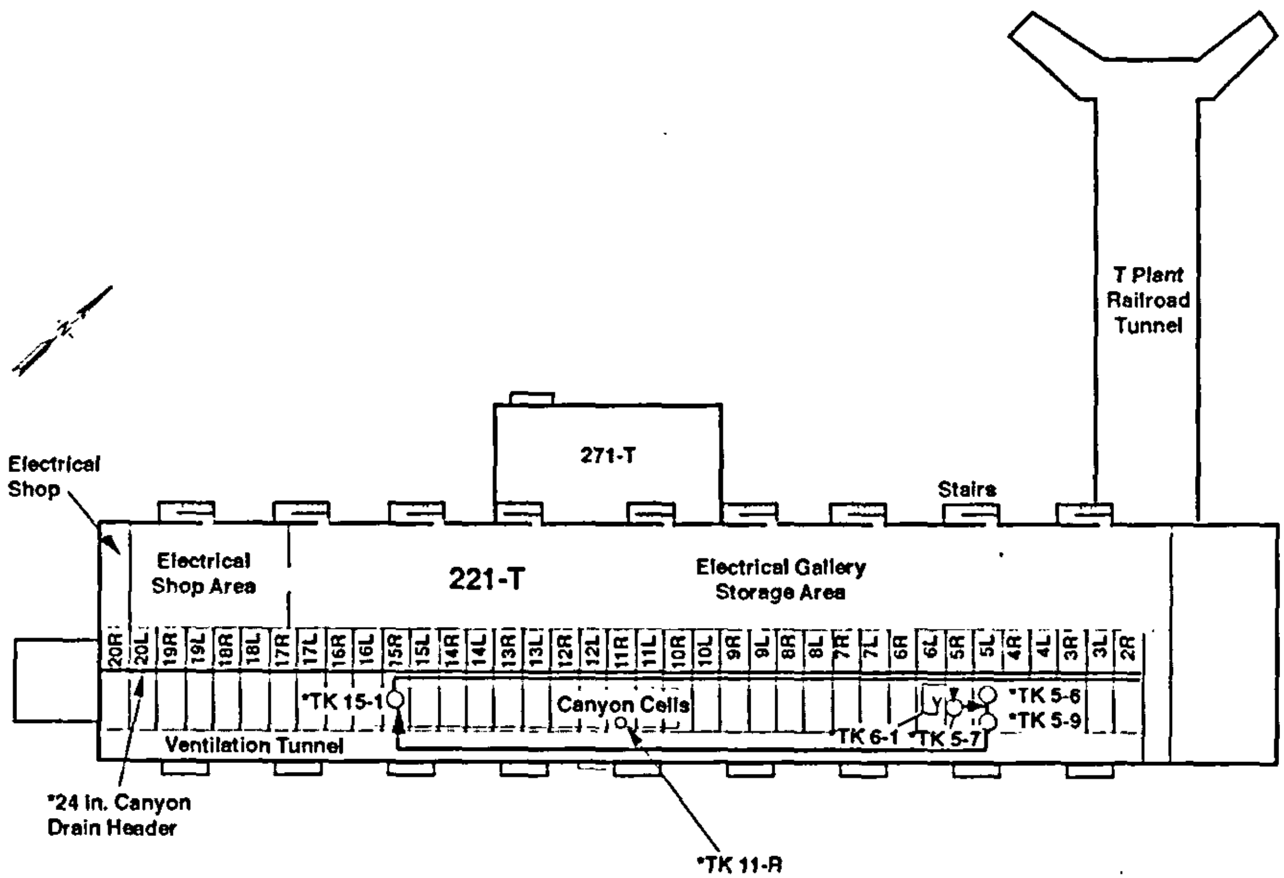


Figure 4. Air flow from the Canyon to the Stack.

T Plant Complex
Process Cell Locations



Not to Scale
* = Out of service

M407-1 4
7-27-04

Figure 5. Schematic of T Plant Complex Process Cell Locations.

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APPENDIX A

T PLANT BASELINE POTENTIAL TO EMIT RECALCULATED FOR MAXIMALLY EXPOSED INDIVIDUAL AT LIGO

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APPENDIX A

T PLANT BASELINE POTENTIAL TO EMIT RECALCULATED FOR MAXIMALLY EXPOSED INDIVIDUAL AT LIGO

Table A-1. T Plant Baseline PTE Recalculated for MEI at LIGO.

Radionuclide	Existing PTE, (January 2003 NDA measurement, Ci/yr)	CAP88-PC 200 West MEI at LIGO	Existing PTE, Unabated (2003 NDA measurement, mrem/yr)	Existing PTE, Abated (2003 NDA measurement, mrem/yr)	DE-Ci
Sr-90	1.65E-03	8.71E-03	1.40E-05	7.00E-09	7.90E-07
Sb-125	1.17E-06	2.51E-02	2.90E-08	1.45E-11	3.30E-11
Cs-134	9.97E-07	7.02E-02	7.00E-08	3.50E-11	1.30E-10
Cs-137	9.10E-04	2.09E-03	1.90E-06	9.50E-10	8.40E-08
Eu-152	3.21E-06	2.35E-01	7.50E-07	3.75E-10	2.70E-09
Eu-154	7.80E-06	1.90E-01	1.50E-06	7.50E-10	8.30E-09
Eu-155	1.95E-05	7.43E-03	1.40E-07	7.00E-11	2.70E-09
Pu-238	1.95E-05	6.53E+00	1.30E-04	6.50E-08	1.80E-05
Pu-239/240	1.47E-03	7.02E+00	1.00E-02	5.00E-06	1.50E-03
Am-241	1.08E-04	1.12E+01	1.20E-03	6.00E-07	9.10E-05
Total	4.19E-03		1.2E-02	5.7E-06	1.6E-03

This table is intended to cover everything not specifically addressed by existing NOC approvals (i.e., ongoing baseline operations). The non-destructive assay (NDA) that was performed in 2003 on the 291-T-1 exhaust stack ventilation system demonstrated that the ongoing T Plant operations, before receipt of sludge, were minor. WDOH did not support NDA as adequate to determine PTE for all T Plant operations (ongoing and proposed new activities), which is the reason this consolidated NOC was required. However, WDOH did agree that current operations could continue until such time as this NOC application is approved. The PTE in Table A-1 reflects the PTE for ongoing operations, as a baseline, until this consolidated NOC is approved. On approval, Appendix A will become obsolete and be superseded by Appendix B. Note that the 1.6 E-3 DE-Ci total for Appendix A is not significant compared to the 1.5 E+4 DE-Ci total for Appendix B.

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APPENDIX B.

ONGOING AND PROPOSED T PLANT OPERATIONS

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APPENDIX B

ONGOING AND PROPOSED T PLANT OPERATIONS

The ongoing activities include repackaging contact handled mixed or TRU waste as well as those activities described in Section 5.0. Both ongoing and proposed future activities, including M-91 described as follows, are addressed to provide a consolidated total PTE for T Plant operations that concern the 291-T-1 exhaust stack. Proposed future activities are described as follows:

M-91 Initiative Contact-Handled (CH) and Remote-Handled (RH) TRU Waste Storage and Treatment Project

Initial efforts to identify capabilities for processing waste began in the mid-1980s. Continuing evaluation of waste treatability groups, waste acceptance criteria, cleanup schedules, and budget considerations, resulted in development of a new set of Tri-Party Agreement milestones, the M-91 series. These evaluations resulted in establishing T Plant as the baseline for RH and large container processing.

In the previous evaluation of alternatives, modifying T Plant is identified as the selected alternative. The modified portion of T Plant is known on the Hanford Site as the "M-91 Capability," named for the M-91 Tri-Party Agreement milestone. The M-91 Capability also is anticipated to provide for processing of the RH TRU waste and the CH TRU waste that cannot be accepted into the WRAP Facility.

Transfer of RH processing will be by truck whether the waste is directly from storage or a generator. The receiving function, i.e., T Plant, has the capability to remove the waste container from the transport vehicle. Cask or overpack handling capability is will be required.

Size reduction will be performed if needed to make large items more manageable and able to fit into smaller containers. Waste will be sorted to group the waste according to processing requirements. Items requiring thermal treatment will be segregated from those requiring nonthermal stabilization. Stabilization will consist of adding a reagent to the waste to immobilize any hazardous constituents present. The contaminants will not be removed or destroyed but the mobility of the contaminants is decreased by adding a stabilizing agent, such as Portland cement or other approved material.

The RH Mixed Low-Level Waste (MLLW) will be packaged into containers for disposal. Waste either will be transferred to storage awaiting disposal or will be transferred directly to disposal.

The commercial stabilization and macroencapsulation treatment could be supplemented or replaced by capabilities that exists within T Plant. While the use of the T Plant canyon is planned for use in treating RH waste, the canyon also has been used to open, inspect, segregate, and repackage mixed waste (MW). T Plant will also process MW that is 'unusual' in that special management may be required.

Transuranic Mixed (TRUM) Waste

Sorting/Repackaging Large Containers

Approximately 300 cubic meters of stored and forecast RH large boxed waste, and approximately 44 cubic meters of ion exchange column waste will need sorting and repackaging. Stored waste represents approximately 50% of the large container volume and consists of 65 containers, all weighing less than 18 metric tons and ranging in size from 0.4 cubic meter to 9.1 cubic meters. The sorting operation will include remote material handling equipment to enable opening boxes to separate large items, and to support size reduction of waste items. The final operations performed in the sort/repack area will be loading of waste into containers and closing the containers.

Size Reduction

The capability to perform size reduction will be needed, and could require the use of remotely operated tools. Dimensions and thicknesses of materials to be size reduced will be determined in the engineering studies. Waste boxes constructed of fiberboard, wood, and/or fiberglass reinforced plywood (FRP) also could be size reduced waste boxes constructed of concrete and/or metal could be recycled as burial containers for Low-Level Waste (LLW).

Sorting

Sorting operations could be performed on drums and small containers of waste. T Plant will provide remote material handling equipment to move, open, empty, and close boxes.

Solidification/Neutralization/Deactivation

T Plant will provide the capability to convert sludge into solids. Handling equipment will be provided to remove the sludge from the packaging. The treatment system will be designed to handle liquids and sludges and be operated in batch mode. The treated waste will be packaged in drums.

Verification/Certification

T Plant will provide the capability to verify that waste packaged in drums meets the 100 nanocuries per gram segregation limit for TRU waste, and also perform certification of TRU waste before shipment to WIPP.

Loadout

Loadout facilities will be provided to load RH waste into WIPP approved containers for placement into compliant transportation systems (i.e., the Nuclear Regulatory Commission RH72-B or equivalent shipping canister).

Potential-to-emit for combined ongoing and proposed T Plant operations

As described in Sections 6.0 and 10.0, a bounding inventory for estimating PTE for T Plant operations (excluding fuel and sludge, previously described in Appendices C and E) is 15,000 DE-Ci. This upper bound represents an annual estimate that includes existing inventory, future M-91 activities, as well as all ongoing operations at T Plant. Tracking DE-Ci for items received, processed, and shipped out of T Plant will account for the throughput at T Plant, which will be maintained below 15,000 DE-Ci per year.

An evaluation of the SWITS information for all the 175 boxes contained in the 218-W-4C Burial Grounds indicated a total inventory of less than 6,500 DE-Ci (15,600 Ci total). Retrieval and processing of 3.5 boxes per week theoretically is possible in a year's time, but it is somewhat unrealistic that all of the boxes would require processing at T Plant in just 1 year under the current TRU retrieval schedule. Another evaluation of over 1,250 containers (drums and boxes) from CWC that have been repackaged or could require repackaging at T Plant (10,500 Ci total, or 2,200 De-Ci) as part of ongoing operations included the development of a screening process to ensure that the 291-T-1 exhaust stack would continue to operate as a minor stack until receipt of sludge or approval of this NOC, whichever comes first.

The 221-T limit of 7,850 DE-Ci for maximum inventory at any one time, coupled with the two mentioned evaluations of SWITs information, support that 15,000 DE-Ci is a good bounding estimate to represent all of T Plant operations (excluding sludge and fuel, which are addressed separately).

Calculating DE-Ci is relatively straight forward, multiplying the activity of each isotope in a container by the corresponding International Commission of Radiation Protection (ICRP) 71 DE-Ci Correction Factor (HNF-EP-0063, Table A-1). The total DE-Ci of the waste package is the sum of the DE-Ci values for all isotopes in the waste. Calculating DE-Ci is a method of normalizing the exposure risk of various isotopes, and is very useful in comparing wastes with varied isotopic distributions, tracking and comparing totals to procedural limits. Estimating quantities of individual radionuclides from a DE-Ci limit is much more difficult. A reasonable estimate has been developed using the DE-Ci correction factors and the isotopic distribution obtained from destructive analysis of the pre-filter number 4, representing about 10 years of operations.

The four significant radionuclides from the pre-filter analysis were Sr-90, Cs-137, Pu-239/240, and Am-241. The analytical results and the DE-Ci correction factors are shown in the Table B-1, followed by the algebraic solution for the quantities for each of the four radionuclides that would be present in 15,000 DE-Ci that were in the same isotopic ratio as the pre-filter analysis.

Table B-1. Estimated Ci Present in 15,000 DE-Ci.

Radionuclide	Analytical result Pre-filter #4	ICRP 71 DE-Ci correction factor	Ci/yr present in 15,000 DE-Ci
Sr-90	3.24 E-1 μCi/ml	4.8 E-4	1.94E+04
Cs-137	2.44 E-1 μCi/ml	9.2 E-5	1.46E+04
Pu-239/240	2.31 E-1 μCi/ml	1.0 E+0	1.38E+04
Am-241	2.30 E-2 μCi/ml	8.4 E-1	1.38E+03
Total PTE			4.92E+04

To solve for the radionuclide quantities, let A = Sr-90, B = Cs-137, C = Pu-239/240, and D = Am-241.

1) The total DE-CI = 15,000 = 4.8E-4*A + 9.2E-5*B + 1.0*C + 8.4E-1*D.

Three additional equations are needed to solve for the four unknowns.

Using the ratio between Sr-90 and Cs-137, the second equation is:

2) A/B = 3.24E-1/2.44E-1 = 1.33, or **A = 1.328 B.**

Using the ratio between Pu-239/240 and Am-241, the third equation is:

3) C/D = 2.31E-1/2.30E-2 = 10, or **C = 10.04 D.**

Using the ratio between beta/gamma and alpha, the fourth equation is:

4) (A + B)/(C + D) = (3.24E-1 + 2.44 E-1)/(2.31E-1 + 2.30 E-2) = 2.24.

Substituting the second and third equations into the fourth equation:

(1.328+1)B/(10.04 +1)D = 2.24, or B = 2.24 * 11.04 D/2.328, or **B = 10.6 D.**

Finally, substituting the three unknowns in terms of D into the initial equation:

$$15{,}000 = (4.8E\text{-}4)(1.328)(10.6)\,D + (9.2E\text{-}5)(10.6)\,D + (1.0)(10.04)\,D + (8.4E\text{-}1)\,D.$$

Solving for D:

$$D = 15{,}000/[(4.8E\text{-}4)(1.328)(10.6) + (9.2E\text{-}5)(10.6) + 10.04 + 0.84\} = 1378.$$

The solutions for A, B, and C follow, as shown in Table B-1.

Appling the estimated Ci inventory in Table B-1, and applying a release fraction of 1.0 E-3, the estimated potential unabated releases and PTE are shown in Table B-2. Potential abated releases and PTE are shown, using an abatement factor of 2,000 for the HEPA filtration system for the 291-T-1 exhaust stack.

Table B-2. T Plant Operations (Excluding Sludge and Fuel).

Isotope	Potential unabated release (Ci/yr)	Potential abated release (Ci/yr)	Dose factor CAP88-PC* (mrem/Ci)	Unabated offsite dose (mrem/yr)	Abated offsite dose (mrem/yr)
Sr-90	1.94E+01	9.7E-03	8.7E-03	1.7E-01	8.4E-05
Cs-137	1.46E+01	7.3E-04	2.1E-01	3.1E+00	1.5E-04
Pu-239/240	1.38E+01	6.9E-03	7.0E+00	9.7E+01	4.8E-02
Am-241	1.38E+00	6.9E-04	1.1E+01	1.5E+01	7.6E-03
Total PTE				1.2E+02	5.6E-02

APPENDIX C

224-T PROCESS CELLS CHARACTERIZATION

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APPENDIX C

224-T PROCESS CELLS CHARACTERIZATION

This process is limited to: entering the 224-T Building to determine the condition and contents of the cells, tanks, and vessels.

A containment tent will be erected outside each access door. The containment tent will consist of two or more chambers, where the inner chamber surrounds the cell door and the outer chamber functions as an airlock. Alpha and beta CAMs will monitor each chamber and will run continuously while work is going on in the cell or containment tent. The inner chamber will be fitted with a Type I portable temporary radioactive air emissions unit (PTRAEU) exhauster to provide air flow and contamination control in the containment tent. The exhauster will be run intermittently to control radiological conditions, at the direction of the field work supervisor in collaboration with the HPT. The containment tent will be isolated from the cell (door closed or otherwise blocked) before operating the exhauster. The Type I PTRAEU will be used in accordance with the conditions, controls, monitoring requirements and limitations of PTRAEU, Revision 2, approval letter AIR 99-1102, dated November 4, 1999.

Note that the 8.31 E-3 mrem/yr unabated PTE from the 224-T Characterization NOC (DOE/RL-2000-19, Rev. 1) corresponds to a DE-Ci total of 3.5 E+1 for Appendix C, which is not significant compared to the 1.5 E+4 DE-Ci total for Appendix B. Also note that 224-T will be isolated from the 291-T-1 exhaust stack in the near future, at which time Appendix C will become obsolete.

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APPENDIX D

FUEL REMOVAL

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APPENDIX D

FUEL REMOVAL

Seventy-two 3.7-meter long irradiated blanket fuel assemblies (BFAs) originally were stored underwater in a 4-meter wide by 8-meter long by 8.5-meter deep pool (Cell 2R) that contains about 190,000 liters of water when filled to a depth of 5.8 meters. These BFAs are in the process of being removed from T Plant and transported onsite to the CSB as discussed in the *Radioactive Air Emissions Notice of Construction for the T Plant Complex Fuel Removal Project* (DOE/RL-2000-64) - refer to Appendix D. As of June 2004 approximately two-thirds of the 72 BFAs were relocated to the CSB. The storage pool is equipped with systems to provide conditioned water. The BFAs are stored in racks at one end of the pool. This end of the pool can be covered with cover blocks to protect the fuel from potential falling objects. The remaining pool surface is open to the canyon.

The chemical and physical processes associated with the fuel removal project will consist of the following.

- The Shippingport Spent Fuel Containers (SSFCs), inserts, shield plugs, shield plug seals, fuel conditioning system skid, and required tools will be staged at T Plant.

- The SSFC/cask/transporter will be moved into the 221-T Tunnel and the divider insert and loading guide will be installed in the SSFC.

- The hoist will be moved to the spent fuel pool using the canyon bridge crane to position. The fuel assembly will be grappled remotely, raised from the pool, and the fuel assembly identification number recorded.

- The fuel assembly will be transferred over the cell partition and lowered into the SSFC. After four fuel assemblies are placed in a SSFC, the shield plug will be installed and the SSFC will be sealed – bolted shut. The SSFC ID number associated with the fuel assembly ID numbers will be recorded.

- The SSFC will be transferred to the fuel transport cask and processed by the fuel conditioning system skid (drain SSFC, dry SSFC, perform SSFC inerting, and leak test SSFC to verify closure).

- The cask lid will be placed on the cask and the cask will be sealed and transported to the CSB. After off-loading the SSFC at the CSB, the cask and transporter will be returned to the 221-T Tunnel. This will take 18 transports to transfer the 72 fuel assemblies.

- The pool water will be pumped out into transport containers and transported to a permitted liquid waste treatment/disposal facility.

- There is minimal buildup of sludge in the bottom of the spent fuel pool, associated with the settling of dust and debris over the spent fuel pool from work activities in other parts of the canyon over the past more than 20 years. The sludge will be removed, characterized, stabilized, and packaged for storage or disposal at an appropriate TSD unit.

- The chillers, ion exchange column, and filter system will be removed and placed in waste disposal containers. The fuel racks will be size reduced and placed into waste disposal containers. The waste disposal containers will be transferred to the appropriate TSD unit.

Activities for decontamination of the spent fuel pool (e.g., removal of sludge, filter system, and racks) are consistent with the current mission, procedures, and inventory at T Plant. These activities will be considered as established routine activities, and are not addressed in the PTE calculations for this NOC.

CRUD ACTIVITY

The crud activity was based on analysis of a seed assembly from the 1969 refueling of the Shippingport reactor. Since the assemblies at the 221-T Building were exposed in the Shippingport reactor for a longer period, the crud buildup was corrected for this extended exposure. The concentrations were corrected for radioactive decay. Crud activity (decay corrected to 2001) was calculated at 1.33 E-1 $\mu Ci/dm^2$ for iron-55, 4.03 E+0 $\mu Ci/dm^2$ for cobalt-60, and 6.73 E+0 $\mu Ci/dm^2$ for nickel-63.

POTENTIAL-TO-EMIT FOR CRUD AND FUEL

The crud activity as described in the Fuel Removal NOC (DOE/RL-2000-64, Rev.1) had an unabated PTE of 1.6 E-5 mrem/yr, corresponding to a DE-Ci total of 5.4 E-4, which is not significant compared to the 1.5 E+4 DE-Ci total for Appendix B.

The fuel activity (1.6 E+6 Ci, decayed to 2001) described in the Fuel Removal NOC (DOE/RL-2000-64, Rev.1) was considered equivalent to a sealed source and was not included in the unabated PTE. The fuel activity has been decay corrected to 1.6 E+6 Ci (2004) and is now included in the total unabated PTE as a solid instead of an equivalent sealed source. The 1.6 E+6 Ci fuel inventory corresponds to a total of 9.0 E+4 DE-Ci. Normalizing the release fraction for solids yields an equivalent 90.0 DE-Ci for the fuel. Dividing the solids release fraction by the particulate release fraction that is used in Appendix B yields a normalized release fraction of 1.0E-03 for the 90.0 DE-Ci.

The combined normalized total of 9.0 E+1 DE-Ci for Appendix C (fuel and crud) is not significant compared to the 1.5 E+4 DE-Ci total for Appendix B. Note that the remaining fuel will be removed in the near future, at which time Appendix D will become obsolete.

APPENDIX E

SLUDGE STORAGE AND TREATMENT

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APPENDIX E

SLUDGE STORAGE AND TREATMENT

The chemical and physical processes associated with the sludge storage consist of the following.

- After all existing 72 fuel assemblies have been removed and the spent fuel pool water has been removed in accordance with the T Plant Complex Fuel Removal NOC (DOE/RL-2000-64, Rev. 1), the 221-T canyon spent fuel pool will be decontaminated to acceptable levels by T Plant operations personnel. Following the activities covered in the fuel removal NOC (DOE/RL-2000-64, Rev. 1), disposal of fuel assembly racks, the filtration system, ion exchange system, and any residual contamination on the pools walls and floor will be accomplished using the following methods (or similar methods resulting in the same or lower potential-to emit):

  - Hand, spray, and abrasive methods
  - Steam cleaning
  - High pressure hot water
  - High pressure cold water
  - Ice blasting
  - Abrasive tools.

- Survey plans, re-entry plans, job hazard analyses, work packages, and RWPs address task specific requirements. Radioactive waste is managed in accordance with written facility and Hanford Site waste management procedures and acceptance criteria. Criteria for moving containers from the canyon into the 221-T Tunnel have been established for low and medium risk evolutions. These criteria include smearable contamination on the outside of the container. Results are maintained at the facility.

- If the pool cell is to be used in accordance with the final design, a new liner system will be installed in the pool as well as in four to twelve of the process cells. Existing water conditioning systems (coolers, filtration system, ion exchange columns, etc.) could be used, modified, replaced, or removed if storage under water is required.

- The physical and chemical characteristics of the sludge are documented in HNF-SD-SNF-TI-009. Sludge containers configured for dry storage will be used for the less reactive floor and pit sludge components, including windblown sand and rocks, spalled concrete from the containment walls, iron and aluminum corrosion products, ion exchange resin beads, uranium oxides, and possibly some uranium fuel particles. Some sludges will be removed and are expected to include a substantial amount of metallic uranium, which will react with water and generate heat and hydrogen. Underwater storage is being considered as a means of increasing heat rejection from the containers loaded with this sludge. This sludge will be stored in containers configured for storage underwater or for dry storage if allowed by criticality and thermal analysis.

- Physical upgrades to the 221-T canyon have been completed to include installation of new cell containment, liner bracing systems, sump pumps, leak detectors, and instrumentation and controls in the 221-T canyon. Sludges received at T Plant will be placed into interim storage as RH TRU waste at T Plant, specifically in modified process cells of the 221-T Building, where this waste is to be maintained in a retrievable condition pending treatment. The following four process cells in 221-T have been modified to store sludge:

- Cell 3L
- Cell 10L
- Cell 13L
- Cell 15L.

Because of uncertainty on the number of containers needed for storage of sludge, four additional process cells have been cleaned out and are ready to be modified to store sludge or to be used for other missions. These four cleaned out cells are as follows:

- Cell 8R
- Cell 9L
- Cell 14R
- Cell 16R.

Treatment and/or storage activities could take place within any or all of these cells as well as on the canyon deck or in the railroad tunnel.

- Canyon radiation detectors, alarms, and cameras have been upgraded, as necessary, to provide surveillance.

- Based on final design results determined in criticality and heat rejection requirements analysis, sludge containers have and will be designed to ensure a safe storage configuration. Final design has and will, analyze maximum sludge loading and container sizing in an effort to minimize the number of transfers and number of containers needed. More than one type of container might be required for overall sludge storage. If needed, storage racks will be modified or constructed to hold containers for use in the dry process cells or to hold containers for use under water, as determined by final design and dimensions of the sludge containers. The container storage racks have been designed to maximize the capacity and to simplify remote container placement operations.

- Sludge containers will hold sludge below a layer of water, and a layer of air to provide a void space in each container. The functional design requirements of the sludge containers include the ability to maintain the sludge in a wet state during transport and storage. This will enable later removal and treatment of the sludge.

- Sludge containers will be received and placed into interim storage in the 221-T canyon, configured for dry cell storage or storage under water, as determined by final design. All sludge containers handling and placement within the 221-T Building will occur remotely when radiological conditions require it and it will be done via crane operations.

- The containers will arrive via the transport vehicle (tractor and trailer). Each transfer will consist of one transport cask that will be inspected according to approved receipt methods. One of the key aspects of this inspection will be to ensure that the external surfaces of the cask and transporter were not contaminated during transport. Once the inspection is complete and the transfer is accepted, the transport vehicle will back into the 221-T Tunnel. The tractor will be uncoupled from the trailer. The tractor will remain within the Radiological Area outside the 221-T Building. Subsequent sludge activities may vary from this description..

- Sludge container unloading operations will typically be done remotely using the canyon crane system. Within the controlled airspace, T Plant Operations personnel will measure and adjust the pressure within transport cask, providing an indication for whether the transport cask maintained containment during transport. Personnel will then remove the transport cask lid bolts, attach the lifting attachment to the cask lid, and exit the 221-T Tunnel. The crane operator will position the canyon crane (which will be outfitted with the appropriate cask lid grappling device), remove the cask lid, and place the lid in an appropriate location. The crane will be repositioned and, with the appropriate lifting device, the container will be lifted out of the cask and moved into an interim storage location in the canyon pool or a dry process cell, depending on container type.

- As a sludge container is moved from the Tunnel into the canyon, operations personnel will verify remotely the identification ID number and record the container number, via existing camera systems. After the container is removed from the cask and moved to its interim storage location in the canyon, personnel will re-enter the 221-T Tunnel and perform swipes on the transport cask and lid. Then an empty container could be placed in the cask and the lid will be replaced. The tractor will re-enter the 221-T Tunnel from the Radiological Area and connect with the trailer. The transport system will be surveyed for possible contamination on exiting the Radiological Area.

- After placing the sludge containers in the 221-T canyon interim dry storage location, surveillance will be performed to ensure that safety, regulatory, and safeguards, and security requirements are met. Water levels within the dry storage containers will be monitored (weight differential), and water additions will be made remotely, as necessary.

- If sludge containers are placed in an interim underwater pool storage location, surveillance will be performed to ensure that safety, regulatory, and safeguards, and security requirements are met. Pool storage conditions (water quality, water temperature, water level, and ion exchange column status) will be monitored and water will be added as needed to the pool to maintain necessary level.

SLUDGE TREATMENT

Treatment of the sludge at T Plant consists primarily of mixing the sludge with grout and is considered a routine treatment operation as defined throughout this document.

The major process steps for sludge treatment are as follows:

- Transferring sludge from the Large Diameter Container (LDC) into the grout system

- Sampling radiochemical composition to ensure grouted containers meet disposition requisition requirements

- Transferring aliquots into WIPP certified 55 gallon drums or other approved containers.

- Grouting the mixture to meet WIPP waste acceptance criteria.

SLUDGE STORAGE/TREATMENT POTENTIAL-TO-EMIT

The near term storage/treatment for K Basins sludge is limited to the NLOP sludge. The total Ci of the NLOP sludge is estimated at 4.77 E+02 Ci, with an unabated PTE of 2.6 E-01 mrem/yr, corresponding to a total of 3.6 E+1 DE-Ci, which is not significant compared to the 1.5 E+4 DE-Ci total in Appendix B.

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Simmons, Fen M

From: Collins, Michael S
Sent: Tuesday, September 07, 2004 10:00 AM
To: Simmons, Fen M
Subject: RE: Consolidated T Plant NOC for OUO review

I have no comments. Go ahead and send it in.
-----Original Message-----
From: Simmons, Fen M
Sent: Tuesday, September 07, 2004 8:48 AM
To: Collins, Michael S; Spracklen, Michael L
Subject: Consolidated T Plant NOC for OUO review

Attached for your review and concurrence is the Consolidated T Plant NOC which needs to be released for Public Review. If you wish to concur electronically you may respond via email or fax (372-2828).
Thanks,

Fen Simmons
372-0413

Simmons, Fen M

From: Spracklen, Michael L
Sent: Tuesday, September 07, 2004 2:29 PM
To: Simmons, Fen M
Subject: RE: Consolidated T Plant NOC for OUO review

The subject document is OK for public release from a safeguards and security standpoint.

Mike Spracklen
PHMC Classification Officer
376-3730

From: Simmons, Fen M
Sent: Tuesday, September 07, 2004 8:48 AM
To: Collins, Michael S; Spracklen, Michael L
Subject: Consolidated T Plant NOC for OUO review

Attached for your review and concurrence is the Consolidated T Plant NOC which needs to be released for Public Review. If you wish to concur electronically you may respond via email or fax (372-2828).
Thanks,

Fen Simmons
372-0413

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